Draft Revised OU2 Screening-Level Ecological Risk Assessment

Shieldalloy Metallurgical Corporation Facility Newfield, New Jersey

Prepared for:

U.S. Environmental Protection Agency
Region 2
New York City, New York

Prepared by:

TRC
12th Floor East Tower
Center Square
1500 Market Street
Philadelphia, PA 19102

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
AUF	Area Use Factor
BAF	Bioaccumulation Factor
BCF	Bioconcentration Factor
BSAF	Biota:Sediment Accumulation Factor
COPEC	Contaminant of Potential Ecological Concem
CLP	Contract Laboratory Program
CSM	Conceptual Site Model
EC50	Effect Concentration affecting 50 percent of the test organisms
Eco-SSL	Ecological Soil Screening Level
ER-L	Effect Range – Low
ER-M	Effect Range - Median
HI	Ecological Hazard Index
HQ	Ecological Hazard Quotient
EqP	Equilibrium Partitioning
ER-L	Effects Range – Low
ER-M	Effects Range - Median
FIR	Food Ingestion Rate
kg/kg BW-day	kilogram per kilogram body weight per day
Kow	Octanol-water partitioning coefficient
LC50	Lethal Concentration affecting 50 percent of the organisms
LCV	Lowest Chronic Value
LEL	Lowest Effect Level
LOAEL	Lowest Observable Adverse Effect Level

LIST OF ACRONYMS (Continued)

MATC	Maximum Acceptable Toxicant Concentration
mg/kg BW-day	milligrams per kilogram body weight per day
mg/kg	milhgrams per kilogram
NJDEP	New Jersey Department of Enviromnental Protection
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observable Adverse Effects Level
OU	Operable Unit
PAH	Polycyclic Aroinatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCOPEC	Preliminary Contaminant of Potential Ecological Concern
PEC	Probable Effect Concentration
RI	Remedial Investigation
SEL	Severe Effect Level
SMDP	Scientific/Management Decision Point
SQL	Sample Quantification Limit
SLERA	Screening-Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TEC	Threshold Effect Concentration
TRC	TRC Environmental Corporation
TRV	Toxicity Reference Value
TUF	Temporal Use Factor
VOC	Volatile Organic Compound
UCL	Upper Confidence Limit

LIST OF ACRONYMS (Continued)

ug/kg	micrograms per kilogram
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1.0 INTRODUCTION

TRC Enviromnental Gorporation (TRC) has prepared this Operable Unit 2 (OU2) Revised Screening Level Ecological Risk Assessment for the Shieldalloy Metallurgical Site (SMC Site), located in Newfield, New Jersey. TRG and SMG executed the Administrative Order on Consent (AOC) for the Site with the U.S. Environmental Protection Agency (USEPA) on April 28, 2010. The AOC defined the following OUs:

- OU1-Non-Perchlorate Ground Water;
- OU2-Non-Perchlorate Soil, Sediment, and Surface Water; and
- OU3-Perchlorate, all media.

The revised screening-level ecological risk assessment (SLERA) satisfies Section III Task VII.B of the AOC's Scope of Work. The OU2 Supplemental Remedial Investigation Work Plan is complimentary to the SLERA and will provide the characterization of the nature and extent of OU2 and allow development of the Feasibility Study.

This SLERA describes existing habitats and ecological receptor species that have been noted or are expected to be present at the Shieldalloy Metallurgical Corporation (SMC) facility in Newfield, New Jersey (the "Site") and evaluates the potential risks associated with the exposure of these biota to surface water, sediment and surface soil contaminants detected during previous investigations. The objective of this risk assessment is to evaluate whether contaminants present on or in the vicinity of the Site may pose adverse impacts to biota and to determine whether a more site-specific evaluation is needed to assess whether adverse impacts are occurring within specific exposure areas.

This ecological risk assessment was conducted in accordance with the following U.S. Environmental Protection Agency (USEPA) guidance:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA/540/R-97-006. June 1997 (USEPA, 1997).

- Guidelines for Ecological Risk Assessment. EPA/630/R-958/002Fa. May 1998 (USEPA, 1998).

The USEPA (1997) document outlines an 8-step process, including numerous scientific/management decision points (SMDPs), for evaluating potential risks to potential receptors. The SLERA (Steps 1 and 2) is a streamlined version of the complete process, and is intended to allow a rapid determination as to whether the Site either poses no ecological risks, or to identify which contaminants and exposure pathways require further evaluation. If ho risks are estimated during the screening level evaluation using conservative assumptions, the ecological risk assessment process stops at that point. If the screening level evaluation predicts risks to ecological receptors, then further evaluation is required including the further identification or refinement of contaminants of ecological concern (Step 3A). One objective of the 8-step

approach is to characterize and quantify, as appropriate, the current and future ecological risks at the site if a no-action altemative is implemented.

The SLERA consists of a screening level problem formulation, ecological effects evaluation, preliminary exposure estimates and risk calculation (Steps 1 and 2). Because of the conservative assumptions used during Steps 1 and 2, some preliminary contaminants of potential ecological concem (PCOPECs) may still pose negligible risk. Therefore, in Step 3A, further evaluation of the assumptions used and other site specific-specific information are considered to refine the PCOPECs and establish a final list of contaminants of potential ecological concern (COPECs). These components are discussed in the following sections.

This SLERA provides introductory information in Section 1. Section 2 describes the ecological resources present at the Site, formulates the risk assessment problem including the proposed assessment endpoints and measures of effect. Environmental samples used in the SLERA and preliminary contaminants of potential ecological concem (PCOPECs) are also presented in this section as is a brief review of the fate/transport mechanisms for the PCOPECs. Section 3 provides an assessment of potential effects of these contaminants to various receptor organisms while Section 4 includes the evaluation of biota exposed to Site PCOPECs. Section 5 characterizes risk to ecological receptors inhabiting the Site. Section 6 then refines the PCOPECs to generate a list of COPECs that require additional evaluation in order to conclude that these contaminants do not provide Site-related risk to ecological receptors. A summary and conclusions are presented in Section 7 and a list of references cited in the SLERA is provided in Section 8.

2.0 PROBLEM FORMULATION (STEP 1)

The Problem Formulation consists of an evaluation of the following:

- Environmental Setting and Potential Receptors;
- Site Contaminants;
- Contaminant Fate and Transport;
- Complete Exposure Pathways; and
- Assessment and Measurement Endpoints.

The Environmental Setting and Potential Receptors section briefly describe habitats present at or nearby the Site and identifies potential receptor species. Preliminary contaminants of potential ecological concern (PCOPECs) identified at the Site, as well as their fate and transport mechanisms are discussed. Complete exposure pathways are also identified. The results of these components are then used to develop the proposed assessment and measurement endpoints.

2.1 ENVIRONMENTAL SETTING AND POTENTIAL RECEPTORS

The SMC Facihty comprises approximately 67.7 acres. The on-site acreage consists of lot and block numbers in Newfield and Vineland, New Jersey, which are in Cloucester and Cumberland Counties, respectively. SMC also owns 19.8 acres of farmland in Vineland, New Jersey, within Cumberland County. This 19.8 acre parcel is approximately 2,000 feet southwest of the SMC Facility. SMC purchased the Farm Parcel to facilitate groundwater remediation, which includes a pumping well at this location. This Farm Parcel has never been used for manufacturing or related activities. A site location map is provided in Figure 2-1.

The SMC Facility is located approximately five miles to the west of the New Jersey Pinelands National Reserve. The Pinelands is distinctive for the widespread occurrence of dry pine, oak, and heath communities in a humid, temperate, deciduous forest climate. These low-nutrient and fire-adapted species have been successfnl in establishing and maintaining themselves competitively over the last several thousand years on the sandy, well-drained, nutrient-poor soils. The upland and lowland plant communities of the Pinelands are distinct from each other, due primarily to soil moisture differences. The ecological significance of the Pinelands is attributable to its status as the largest area of contiguous, undeveloped forest and wetland on the Atlantic Coastal Plain of the Mid-Atlantic region with a mosaic of globally rare upland and wetland communities and species of national significance.

The Site is characterized by sandy unconsolldated soils, flat to gently sloping terrain, and vegetative and wetland types that are similar to the nearby Pinelands. The Hudson Branch flows along the southem portion of the Site, with its headwaters located to the east. The headwaters of the Hudson Branch are characterized by an extensive wetland that develops into a ponded area, from which the Hudson Branch flows along a stream course along the southem border of the site. The Hudson Branch is a tributary to Burnt Mill Pond, from which the Bumt Mill Branch flows to the Maurice River. The Maurice River receives the FW2-NT (Category II) classification in its upper reaches, while the classification for the lower portion is FW2-NT (Category I). Since the Hudson Branch flows into the upper portion of the Maurice River, it also receives the Category

II classification. Several aquatic, wetland and terrestrial habitats are present at the SMC Facility or in association with the Hudson Branch. These habitats consist of perennial stream (Hudson Branch), ponds (ponded portions of the Hudson Branch), palustrine emergent marsh, palustrine scrub-shmb wetland, palustrine forested wetland, forested upland and maintained grassland areas. In addition, disturbed areas that are devoid of vegetation are present throughout the developed portions of the SMC Facility. These areas do not provide suitable habitat for ecological receptors. The various habitats are described in more detail below.

2.1.1 Aquatic Habitats

Aquatic habitats are associated with the Hudson Branch, a small perennial stream that is located along the southern boundary of the SMC Facility (see Figure 2-1). The Hudson Branch generally flows to the southwest for approximately 1.3 miles, where it flows into Burnt Mill Pond. Burnt Mill Pond has a surface area of approximately 15 acres in size and is impounded by a dam. Burnt Mill Pond is reported to be shallow, with a mean depth of 2.4 feet.

The upstream drainage area of the Hudson Branch is estimated at 1,180 acres (TRC, 2006). Runoff enters the Hudson Branch via overland flow and a number of culverts, including a north-south 36-inch diameter culvert that bisects the Site and conveys stormwater from areas of Newfield north of the Site to Hudson Branch. The channel of the Hudson Branch along the southern boundary of the Site varies in size; its width ranges from as little as a few feet at many locations to 100 feet wide at the broader area.

Burnt Mill Branch (sometimes referred to as the Manaway Branch) generally runs north to south and discharges into Burnt Mill Pond. Burnt Mill Branch is located approximately 4,000 feet west of the Site. The headwaters of Burnt Mill Branch begin approximately 7,000 feet northwest of the Site. The Burnt Mill Branch continues from Burnt Mill Pond, joining the Maurice River approximately 9,000 feet southwest of Burnt Mill Pond.

The Hudson Branch is fairly typical of a low gradient stream in that riffle-run habitats are not present and the stream substrate consists of fine particle-sized material (i.e., fine sands, silt, and clay) with considerable organic matter present. Total organic carbon contents in sediment samples have ranged from 1.2 percent to 64.8 percent. The pH of the Hudson Branch sediments is generally neutral. Two ponded areas of the Hudson Branch have been identified (Figure 2-2). One broad area of ponded water and wetlands vegetation, approximately 1.4 acres in size, is present on SMC property within the headwaters of the Hudson Branch (hereafter referred to as the ponded area), while a small impoundment (approximately 0.3 acres) is present approximately 3,000 feet downstream of the SMC Facility (Figure 2-2). This smaller pond is located in a residential area.

The upstream portion of the Hudson Branch above the ponded area consists of a shallow gully that contains surface water flows only on an intermittent basis. The ponded area is approximately two to six feet in depth. The substrate is soft with a variable total organic carbon content that ranges from 6.6 percent to 19 percent. Vegetation consists primarily of common reed (*Phragmites australis*) and water willow (*Decodon verticillatus*). Water flows from the ponded area through a culvert (under the former Haul Road) to form the Hudson Branch.

The portion of the Hudson Branch located immediately downgradient of the ponded area is a poorly defined channel. Surface water flows generally meander through a broad area of common reed for approximately 750 feet before the Hudson Branch becomes a more defined channel. Based on aerial photographs (ENSR, 1989), the portion of the Hudson Branch immediately downgradient of the ponded area appears to have been channelized within a straight ditch through former cultivated fields. This alteration occurred between 1940 and 1951, and this portion of the Hudson Branch remained channelized until sometime around 1974 to 1977, when the stream appeared to follow a more meandering route.

Approximately 500 feet upgradient of West Boulevard, the Hudson Branch is channelized within two distinct channels. These two channels diverge for approximately 350 feet before rejoining 150 feet upgradient of West Boulevard. The northemmost channel receives discharges from SMC Outfall DSN-004A which includes strormwater and treated ground water that is discharged to the on-site drainage basin before being discharged through the outfall. Downgradient of West Boulevard, the Hudson Branch enters a more defined channel that remains well-defined until its flow into Bumt Mill Pond.

Water depths within the identified stream channel portions of the Hudson Branch (generally present throughout the Hudson Branch downgradient of the area of common reed discussed above) range from several inches to approximately three feet within pooled areas of the stream. Low flow velocities are present throughout the entire reach of the Hudson Branch. Aquatic plants (macrophytes) and submerged logs are also present within the channelized portions of the Hudson Branch.

Portions of the Hudson Branch have been observed to gain surface water (areas of ground water release) during portions of the year while other areas appear to lose surface water (ground water recharge areas). However, surface water release and recharge is variable within reaches of the Hudson Branch and reflects temporal changes due to seasonality and in response to precipitation events.

2.1.2 Terrestrial Habitats

The Site consists of six key areas, namely:

- Former Production Area,
- Former Lagoons Area,
- Eastem Storage Areas,
- Southem Area,
- Natural Resource Restoration Areas, and
- Restricted Area.

A description of the key areas is provided below. A plan depicting the boundaries of these areas and the physical features of the facihty areas is provided as Figure 2-3. In addition, wetlands located within the southem portion of the Site and downgradient of the Site that are associated with the Hudson Branch also represents a key terrestrial habitat that was evaluated in the SLERA.

Former Production Area

The Former Production Area is located in the northwest part of the SMC Facility and is the area where the majority of former manufacturing activities occurred. The Former Production Area is approximately 22 acres, and is the largest key area. The Former Production Area is largely covered with buildings and asphalt or concrete pavement. SMC's future plans for the Former Production Area include the continued use of the buildings for warehousing and constmction equipment storage space (or replacement/repair thereof). Due to the extremely disturbed and developed nature of the Former Production Area, habitat for ecological receptors is very limited. Therefore, complete exposure pathways to ecological receptors are not present and this area is not evaluated further in the SLERA.

Former Lagoons Area

The Former Lagoons Area is located in the central portion of the SMC Facility and occupies approximately 4.5 acres. The Former Lagoons Area includes closed lagoons that were used from the 1960s to the 1990s for wastewater treatment. In May 1992, use of all nine lagoons was discontinued. The nine lagoons were characterized, remediated, and closed from 1994 to 1997. Closure activities included sludge removal, liner removal, contaminated soil removal, post-excavation sampling, and backfilling. In a letter dated August 10, 2001, the NJDEP approved the lagoons closure report (NJDEP, 2001).

Two additional lined basins were located to the west of the former lagoons. These lined basins were used to contain wastewater associated with an air pollution control process. SMC stopped using the basins in early 1990s. In December 1992, the soils below the basins and the adjacent berm soils were sampled per NJDEP requirements. The analytical results indicated that past activities did not impact the surrounding soils. The lined basins were closed in 1993 and the berm soils were used to backfill the former basins.

Currently, the Former Lagoons Area is covered by light vegetation, which includes small trees and grass. SMC is considering a Brownfields/Brightfields approach for the Site, and is considering the Fonner Lagoons Area as the area to potentially receive a solar field. If viable, solar arrays would be placed in this area, after warranted remedial measures have been implemented.

Eastern Storage Areas

The Eastem Storage Areas, which consist of two separate areas bounding the Restricted Area, are located to the east of the Former Production Area and Former Lagoons Area. These areas were previously used as the By-Product Dmm Storage Area and a bone yard. These areas have never included buildings or offices. Currently, the areas are covered with gravel, light vegetation and piles of concrete debris. Most of these areas were developed and included with the Natural Resource Restoration Area, which is discussed below.

Southern Area

The Southern Area is located along the southern property line of the SMC Facility. The Southern Area includes undeveloped areas as well as the on-site impoundment and the Former Thermal Pond Area. The on-site impoundment, as referenced in the current New Jersey Pollutant Discharge Elimination System (NJPDES) permit, receives a combination of facility stormwater and treated water from the on-site groundwater treatment system. The water from the on-site impoundment is directed into a ditch or unnamed tributary of the Hudson Branch. The on-site impoundment was installed in the early 2000s.

The Former Thermal Pond Area covers approximately 0.77 acres and consists of a rectangular depression area of approximately 3 feet deep. The Fonner Thermal Pond Area was used on a few occasions as an emergency holding reservoir for treated wastewater. The Former Thermal Pond Area is currently covered with vegetation (herbaceous vegetation and shmbs primarily).

Based on historical aerial photographs, some areas in the Southern Area were used for miscellaneous storage. Currently, the Southern Area is covered with vegetation that includes grass and small trees. Several areas were developed and included with the Natural Resource Restoration Area; these areas are shown on Figure 2-3.

Natural Resource Restoration Areas

Natural Resource Restoration Areas were established in 1999 and 2000 at designated portions of the facility to provide wildlife habitat value. These Natural Resource Restoration Areas were based on a Natural Resource Restoration Plan was prepared in October 1997 in accordance with the terms of USEPA and NJDEP Environmental Settlement Agreement, which was incorporated into SMC's plan of reorganization pursuant to Chapter 11 of the Bankmptcy Code (US Bankmptcy Court, 1997). In November 1997, the New Jersey Office of Natural Resource Damage reviewed and approved the Natural Resource Restoration Plan.

The Natural Resource Restoration Areas total approximately 9.65 acres, located in a non-contiguous collection of areas around the SMC Facility, including the former lagoons area, the eastern storage areas and the southern area. These areas were established by importing soil (generally a minimum of 1' thick, but as much as 2' thick), then establishing vegetation. Species planted include the following:

- 50% pitch pine (*Pinus rigida*)
- 20% chestnut oak (*Quercus prinus*)
- 20% red oak (*Quercus rubra*)
- 10% persimmon (*Diospyros birginiana*)

Vegetation within these areas includes a variety of herbaceous plants including grasses, trees, and shmbs. In addition to providing natural resource value, these areas were intended as a cap to address potential soil contamination at these locations.

To ensure the planted areas are maintained as vegetated areas, the future use of the planted areas is considered restricted. As such, the nature of these areas cannot be changed, without significant regulatory changes.

Restricted Area

The Restricted Area is located in the eastern portion of the facility and is referred as a controlled area by the Nuclear Regulatory Commission (NRC). Due to the presence of naturally occurring thorium and uranium in the raw material used for ferro-columbium and the resulting slag and dust, this portion of the Facility is restricted.

A chain link fence with barbed wire surrounds this area (providing a second layer of security from the facilities perimeter fence). Additionally, the Restricted Area is posted with specific signage. Site personnel are trained to stay out of this area, unless specific training and/or escort is provided. The Restricted Area is not the subject of the AOC and/or this SLERA.

Hudson Branch Wetlands

Wetlands were delineated along the Hudson Branch in the vicinity of the Site in 1994 by Schoor, DePalma & Canger Environmental Services, Inc., under contract to TRC (Schoor DePalma, 1994). The delineation covered an approximately 100-acre area, which included the Site and the Hudson Branch from the headwaters to the Farm Parcel. Multiple wetland habitats are present adjacent to the Hudson Branch including the following palustrine wetland types: emergent marsh, broad-leaved deciduous forest, scmb-shrub, and open water. The width of the wetlands ranges from approximately 5 feet (along the generally dry portion of Hudson Branch along the SMC Facility boundary) to over 400 feet (near the southwest corner of the Site). A wetland coyer survey was conducted in 1996 by TRC and included the identification and subsequent field survey of the stream center line (thalweg) and limits of each wetland cover type (including the upland/wetland boundary) at 250-foot intervals along the Hudson Branch (TRC, 1996a). The extent of the wetlands and associated habitat types are indicated in Figure 2-2.

Above the unnamed pond, narrow bands of palustrine scmb-shmb and emergent marsh wetlands are located adjacent to the intermittent surface flow areas of the Hudson Branch. Plants noted within these areas include common reed, highbush blueberry (*Vaccinium corymbosum*), and willow (*Salix sp.*). A broad band of wetlands is present at the confluence of the Hudson Branch with the unnamed pond. Although the northern shore of the pond is bordered by a steep bank, the eastern and southern shorelines contain a wide band of emergent herbaceous marsh vegetation (primarily common reed) with a forested overstory consisting of young red maple (*Acer rubrum*).

Downgradient of the unnamed pond, the wetland vegetation consists primarily of common reed immediately adjacent to the Hudson Branch. Wide bands of forested wetlands consisting of red maple and tupelo (*Nyssa sylvatica*) in the overstory are present to the north and south upgradient of the areas of common reed. These forested areas contain a well-stocked and dense stand of intermediate-sized trees with a dense understory of sweet pepperbush, highbush blueberry, laurel, green-brier, and cinnamon fern (*Osmunda cinamomea*). A sparse forest overstory of red

maple is present within the area located between the divided portions of the Hudson Branch (upgradient of West Boulevard).

The broad area of wetlands located between West Boulevard and Weymouth Road consists of a sparse forest overstory (comprised of large mature trees) with a herbaceous understory comprised of various grasses, sedges, and rushes. South of Weymouth Road, the wetlands bordering the Hudson Branch remain fairly extensive with little topographical relief present. This area of wetlands is a well-interspersed area of scrub-shrub and emergent herbaceous wetlands containing common elder (*Sambucus canadensis*), multiflora rose (*Rosa multiflora*), and arrow-wood (*Viburnum recognitum*) in the shrub layer, with various grasses, cat-tail (*Typha latifolia*), water willow, and sensitive fern (*Onoclea sensibilis*) also present. This wetland gradually grades into a palustrine emergent marsh consisting of water willow, pickerel weed (*Pontederia cordata*), and other herbaceous vegetation. A broad area of mature red maple forested wetlands is present downgradient of this marsh. This forested wetlands extends to West Arbor Avenue. South of West Arbor Avenue is a disturbed area that presently contains a small man-made pond that was formed by impounding the Hudson Branch. This disturbed area extends for several hundred feet (to Northern West Avenue) where mature red maple forested wetlands are present until the Hudson Branch reaches Bumt Mill Pond.

The locations of the former lagoons area, eastern storage areas, southern area and the Hudson Branch wetlands are indicated in Figure 2-3. Each of these four areas of terrestrial/wetland habitat is evaluated in this SLERA.

2.1.3 Potential Receptors

Ecological data collected during various investigations conducted at the site and along the Hudson Branch as well as a review of the available literature are used to identify potential receptor species (i.e., amphibians, birds, mammals, and reptiles). Plant species provide an important component of the habitats identified on the Site (and adjacent to the Hudson Branch) and have been briefly discussed in the previous sections. A variety of wildlife receptors have either been observed at the Site or are expected to inhabit the habitats identified on or adjacent to the Site. The primary ecological receptors of concern for the adjacent aquatic habitats are organisms such as macroinvertebrates which inhabit the Hudson Branch and those wildlife species that forage on these receptors. Insectivorous birds and mammals are of particular concern as they are representative of higher trophic level receptors, which are more susceptible to contaminants that bioaccumulate within the tissues of their prey. Terrestrial receptors such as herbivorous/insectivorous/carnivorous birds and mammals may also be at risk due to potential ingestion of contaminated plants and invertebrates that have bioaccumulated elevated levels of contaminants within their tissues from impacted surface soils. Wildlife species that may potentially inhabit the forested wetlands/uplands and the Hudson Branch are discussed below and includes amphibians, birds, mammals, and reptiles.

2.1.3.1 Aquatic Habitat Receptors

A variety of amphibians and reptiles may potentially inhabit the aquatic habitats provided by the stream and ponded areas of the Hudson Branch. Some species, such as the green frog (*Rana clamitans*) and eastern painted turtle (*Chrysemys picta*), may inhabit these aquatic habitats

throughout the year while other species, such as the gray treefrog (*Hyla versicolor*), may only utilize these aquatic habitats for breeding in the spring. During the remainder of the year, species such as the gray treefrog would forage within the adjacent forested wetland/upland cover types. A variety of snake species may forage for prey such as frogs along the banks of the Hudson Branch. Several snake species identified as potential receptors prefer aquatic habitats as foraging areas. Such species include the eastern ribbon snake (*Thamnophis sauritus*) and northern water snake (*Nerodia sipedon*).

Birds that may be present along the Hudson Branch include waterfowl species such as the mallard (*Anas platyrhynchos*) and wading birds including the green heron (*Butorides striatus*). These species may potentially forage for food in and immediately adjacent to the Hudson Branch. Piscivorous (fish eating) species such as the belted kingfisher (*Ceryle alcyon*) may also potentially use ponded areas of the Hudson Branch as a foraging area. Riparian (along the stream bank) gleaners such as the red-winged blackbird (*Agelaius phoeniceus*) may forage on invertebrates or seeds along the banks of the Hudson Branch, while aerial screeners such as the tree swallow (*Tachycineata bicolor*) or eastern phoebe (*Sayornis phoebe*) may forage on insects above the aquatic habitats provided by the Hudson Branch. Other avian species including various sparrows may utilize the dense vegetation along the banks as nesting habitat.

Mammalian use of the Hudson Branch is expected to include several bat species that would forage for insects above the more open areas of aquatic habitat (i.e., ponds, herbaceous emergent marsh). Aquatic habitats are generally productive sites for invertebrates including emerging insects that provide an important food resource for bats. Mammalian predators such as the opossum (*Didelphis virginiana*) and raccoon (*Procyon lotor*) may forage within the emergent marshes and along the banks of the stream and pond habitat. The raccoon and opossum are omnivorous feeders that may consume a wide variety of items (e.g., amphibians, invertebrates) found within the aquatic habitats provided by the Hudson Branch.

A macroinvertebrate survey was previously conducted at various locations of the Hudson Branch. The macroinvertebrate sampling method involved sweeping a D-net along productive habitats (i.e., aquatic vegetation, submerged logs) located within the Hudson Branch. This method provides a qualitative insight into the macroinvertebrate community present within the Hudson Branch. In general, macroinvertebrates present within the ponded area near the facility were comprised primarily of midges (*Chironomidae*), dragonflies/damselflies (*Odonates*), and mayflies (*Ephemeropterans*). Dominant macroinvertebrates noted within the samples collected from the stream portions of the Hudson Branch were the same, with the addition of mollusks.

2.1.3.2 Terrestrial Habitat Receptors

A diverse assemblage of amphibians and reptiles may potentially inhabit the upland and wetland habitats present on or adjacent to the facility. Several amphibian species such as the spring peeper (*Pseudacris crucifer*) and redback salamander (*Plethodon cinereus*) may use the wetland and upland forest cover types available on or adjacent to the Site. A variety of snakes are likely to use the wetland and upland cover types found on the site. Snake species are generally carnivorous and are found both within wetland and upland habitats where prey (i.e., small mammals) are present.

A diversity of bird species may inhabit the forested cover types present at or adjacent to the facility due to the vertical stmctural diversity provided by the overstory and understory vegetation. These species would include sapling/shrub nesters such as the wood thrush (*Hylocichla mustelina*) and gray catbird (*Dumetella carolinensis*) and other insectivores that may consume terrestrial insects and other ground invertebrates. Omnivorous birds such as the American rohin (*Turdus migratorius*) are expected to feed on macroinvertebrates (i.e., earthworms, insects) as well as seeds. Insectivores such as the tufted titmouse (*Parus bicolor*) and downy woodpecker (*Picoides pubescens*) may use the forested habitats while various flycatchers and warblers may also use the forested areas for nesting and/or foraging. Raptors such as various hawks and owls may also forage on small birds and mammals present in both grass and forested cover types.

Mammalian herbivores such as white-tailed deer (*Odocoileus virginianus*) and small mammal species including moles, mice, shrews, and voles are also likely to inhabit the forested habitats. The insectivorous short-tailed shrew (*Blarina brevicauda*) may forage on insects and other invertebrates within the forested and grass habitat of the Site. Mammalian predators such as the red fox (*Vulpes vulpes*) may also forage for small manimals within these habitats.

The New Jersey Natural Heritage Program was recentiy contacted regarding the presence of endangered, threatened, or rare species on or near the Site. Based on the request, the Natural Heritage Database and the Landscape Project habitat mapping were searched for occurrences of any rare wildlife specifies, plant species, wildlife habitat or natural communities on the Site. The Natural Heritage Program identified the great blue heron (*Ardea herodias*) as occurring within the Site. The New Jersey status for the great blue heron is SC/S indicating that the breeding population is listed as Special Concem while the wintering population is stable. In addition, the eastem box turtle (*Terrapene carolina*) and wood thrash (*Hylocichla mustelina*), both listed as state species of Special Concem, occur within ¼ mile of the Site. No records of any additional rare wildlife species, wildlife habitat, rare plants or natural communities were identified within ¼ mile of the site.

The great blue heron forages within aquatic habitats on various prey including fishes and macroinvertebrates. It is a colonial nesting species with nests typically located in trees (often dead trees) within wetlands or ponds. This species may be expected to forage within the Hudson Branch, particularly within the ponded areas or broad shallow marsh areas present within this stream. The eastem box turtle inhabits sandy uplands where it primarily forages on fruit, fungi, and plants. The wood thmsh is primarily an insectivorous bird (although some fruit is also taken) that generally inhabits large, contiguous areas of forested uplands/wetlands.

2.2 SITE CONTAMINANTS

For the characterization of ecological risk, the primary media of concem at the Site are surface water and sediment associated with the aquatic habitats of the Hudson Branch and surface soils within the forested and grassland habitats associated with or adjacent to the facility.

2.2.1 Data Management

Analytical data used in the SLERA include all previous surface water, sediment and surface soil sampling results. Analytical results for each sample are presented in Appendix A. Table 2-1 provides a summary of the data included in the SLERA. The analytical data were statistically summarized by environmental medium (Appendix B). The locations of all surface water, sediment, and surface soil samples are depicted in Figures 2-4 through 2-6.

The following discussion provides an overview of the field investigations conducted at the facility. For additional information, the reader is directed to TRC (1992, 1996a). Data obtained as part of the site characterization were evaluated for their usability by TRC according to USEPA's procedures and guidelines.

Surface Water

Surface water samples were collected from the Hudson Branch during the initial RI of the SMC site to determine the presence, nature, and extent of surface water contamination (TRC, 1992). A total of five surface water samples were collected from locations along the Hudson Branch in October 1990. The surface water samples were collected from (i) the headwaters of the Hudson Branch, (ii) immediately downstream of SMC Outfall 001, (iii) between Weymouth Road and West Boulevard overlying the chromium ground water plume, (iv) just south of the chromium plume along SMC's 19.83 acre farmland parcel, and (v) at the mouth of the Hudson Branch just upstream of the point of flow into Bumt Mill Pond.

Additional surface water samples were collected from five sampling stations (SW-8, SW-11, SW-21, SW-25, and SW-27) in August 1995 as shown on Figure 2-4 (TRC 1996a). Each surface water sample was collected and analyzed for TAL inorganic compounds. Two samples (SW-30 and SW-31) were also collected from Burnt Mill Branch to serve as reference samples as indicated on Figure 2-4. These samples were also analyzed for TAL inorganic compounds. Surface water samples represent total recoverable (i.e., non-filtered) metal concentrations.

The surface water data collected during 1990 and 1995 represent different conditions due to modifications implemented in the SMC ground water remediation system in 1992. The former ion exchange system was replaced by an electrochemical treatment system resulting in increased flow and improved water quality discharged from SMC Outfall 001 to the Hudson Branch. Therefore, only the 1995 surface water samples were utilized for this SLERA as this data more accurately reflects existing conditions within the Hudson Branch. Results for each surface water sample used in the SLERA are presented in Tables A-1 and A-2 of Appendix A while summary statistics are provided in Tables B-1 and B-2 of Appendix B.

Sediment

During the 1990 and the 1995 investigations, sediment samples were collected within the Hudson Branch to determine the presence, nature, and extent of sediment contamination. Stream sediment sampling locations are shown on Figure 2-5. The sampling within ponded areas of the Hudson Branch was limited to the 1995 investigation activities. Pond sediment sampling locations are also depicted on Figure 2-5.

A total of five stream sediment samples were collected along the Hudson Branch in October 1990 (SD01 through SD05). These five sediment samples were collected from a depth of 0 to 6 inches. Three of the sediment samples (SD02, SD03, and SD05) were analyzed for volatile organic compounds (VOCs) and TAL inorganic compounds. The remaining two sediment samples (SD01 and SD04) were analyzed for the expanded parameter list which included TCL+30 and TAL inorganic compounds (TRC, 1992).

The five sediment samples collected from the Hudson Branch during 1990 were found to contain elevated concentrations of inorganic compounds. In order to delineate the extent of inorganic contamination of sediments within the Hudson Branch downstream to Bumt Mill Pond and to define background conditions, 15 stream sediment stations (SD-7, SD-8, SD-11, SD-12, SD-13, SD-14, SD-15, SD-16, SD-17, SD-18, SD-19, SD-20, SD-22, SD-23 and SD-28) were sampled in August 1995 (TRC, 1996a). In addition, eight sediment samples were collected at sediment sampling stations located within ponded areas of the Hudson Branch (SD-9, SD-9A, SD-10, SD-21, SD-24, SD-25, SD-26, and SD-27). Sediment samples were collected from each sediment sampling location from a depth of 0 to 6 inches. However, at station SD-21, the sample was collected from a depth of 0 to 3 inches due to the limited depth of sediment present at that location. Reference sediment samples were also obtained from SD-29, SD-30 and SD-31 along the Bumt Mill Branch. Each of the sediment samples was submitted for TAL inorganic compounds. In addition, the sediment samples collected at SD-11, SD-15, SD-21, and SD-24 were also analyzed for TCL pesticides/polychlorinated biphenyls (PCBs).

Additional sediment characterization studies were conducted in September 1995 (TRC, 1996a). Sediment samples (0 to 6 inches) were collected from six stations (SD-9A, SD-10, SD-14, SD-17, SD-19 and SD-23). Reference sediment samples were also collected at SD-30 and SD-35 on Burnt Mill Branch. These samples were analyzed for TAL inorganic compounds pH, total organic content, and acid volatile sulfide analysis. Each of these sediment samples were also evaluated for toxicity to laboratory test organisms (*Chironomus tentans* and *Hyalella azteca*).

In April 1996, five additional sediment samples were collected at the Hudson Branch in order to determine the lateral extent of metal contamination within downstream areas of the Hudson Branch and the adjacent wetland (the wetland samples are considered soil samples). The locations of these samples are also presented on Figure 2-5. Each of these samples was collected from 0 to 6 inches and analyzed for chromium, copper, nickel and vanadium (TRC, 1996b). Cyanide was also analyzed in three of these samples.

In March 2009, 11 sediment samples were collected from previous sampling locations within the Hudson Branch (SD-4, SD-6, SD-9A, SD-12, SD-15, SD-17, SD-18, SD-19, SD-20, SD-23, and SD-25) to determine concentrations of 10 metals (TRC, 2009). Two reference samples (SD-30 and SD-35) were also collected from the Bumt Mill Branch at this time. All samples were collected from 0 to 6 inches.

All sediment chemistry results from the samples discussed above were evaluated in the SLERA. Summary statistics of the Hudson Branch and reference samples (Burnt Mill Branch) are presented in Tables B-3 and B-4, respectively, of Appendix B.

Surface Soil

A total of 118 surface soil samples collected within or downgradient of the facility from October 1990 through April 1996 were considered relevant to the areas of interest for terrestrial upland/ wetiand receptors (i.e., within areas providing habitat) and therefore were included in the SLERA. Figure 2-6 provides the locations of these surface soil samples. Seventy-five (75) of these samples were collected from a depth of 0 to 6 inches while 15 samples were collected from a depth of 0 to 12 inches. The remaining 28 surface soil samples were collected from the top two feet using a split-spoon sampler during the soil boring program.

In October 1990, 52 surface soil samples were collected from a depth of 0 to 6 inches within the terrestrial/wetland areas providing habitat for ecological receptors (TRC, 1992). Two (2) samples were collected from the former lagoons area, 16 samples from the eastem storage areas, 20 samples from the southem area of the facility, and 14 samples from the wetland associated with the Hudson Branch. These later samples were taken adjacent to the SMC facility. Each of these samples was analyzed for TAL inorganic compounds as well as hexavalent chromium, boron, niobium, strontium and titanium. One surface soil sample collected from the eastem storage areas was also analyzed for TCL VOCs and SVOCs along with pesticides, PCB Aroclors and zirconium.

In November 1990, 24 soil borings from a depth of 0 to 2 feet were collected from the former lagoons area (7 samples), eastem storage area (8 samples) and the southem area (9 samples) (TRC, 1992). Each of these soil samples was analyzed for TAL inorganic compounds and hexavalent chromium. Six samples were also analyzed for the inorganics boron, niobium, strontium and titanium with one of these samples also analyzed for zirconium. Three soil samples collected within the eastem storage areas (SB20-01, SB32-01 and SB33-01) were also analyzed for PCB Aroclors.

In a supplemental sampling investigation performed in August 1995, surface soil samples (0 to 12 inches) were collected in areas of the Site in order to delineate the horizontal extent of contamination detected during the RI (TRC, 1996a). For the purpose of the SLERA, only 15 surface soil samples (SS-13, SS-14 and SS-16 through SS-28) collected in August 1995 are considered relevant and a brief description of the sampling locations is provided below. These sampling locations are also depicted in Figure 2-6.

Seven surface soil samples (SS-16 through SS-21, SS-23, SS-24, and SS-28) were collected in August 1995 within the wetland associated with the Hudson Branch. These samples were collected to fiirther define the extent of inorganic compounds detected during the RI. Each of the surface soil samples was analyzed for TAL inorganic compounds and hexavalent chromium.

Four surface soil samples were collected off-site and to the south of the property line, in the vicinity of RI sample locations RA-5, RA-13, and RA-14. Supplemental surface soil samples SS-25, SS-26 and SS-27 were analyzed for beryllium, while sample SS-22 was analyzed for TAL inorganic compounds and hexavalent chromium. Surface soil samples SS-13 and SS-14 were collected from the eastem storage areas and analyzed for PCB Aroclors.

Several soil borings were also collected from 0 to 2 feef within the eastem storage area and the southem area of the SMC facility during August 1995. Three samples were collected from the eastem storage areas and analyzed for pesticides and PCB Aroclors whlle one additional sample was collected from the southem area and analyzed for hexavalent chromium.

In April 1996, 17 additional surface soil samples were collected at 8 transects (SD-100 through SD-107) within the wetiands associated with the Hudson Branch in order to determine the lateral extent of metal contamination within downstream areas of this wetland (as well as within the sediments of the Hudson Branch) (TRC, 1996b). The locations of these samples are presented on Figure 2-6. Each of these samples was collected from 0 to 6 inches and analyzed for chromium, copper, nickel and vanadium. Cyanide was also analyzed in 11 of these samples.

2.2.2 Data Evaluation

Data were qualified by the analytical laboratory and evaluated for their usability as described previously. The qualification and evaluation of the analytical data included a comparison of the site data to corresponding blank (laboratory, field, equipment, and trip) concentration data. Data rejected by the usability evaluation ("R" qualified) were not used. Estimated values (e.g., "J" qualified) were used in the SLERA without modification. Prior to using analytical data for a primary sample with an associated field duplicate, the analytical values for the primary sample and the field duplicate were averaged together to provide a single set of values for the field duplicate pair. The following conventions were used for field duplicate samples:

- If both samples have detected values (flagged with "J" or unflagged), the average of the values was used. If one value or both values are flagged with "J", prior to averaging, the resulting averaged value was flagged with "J" as appropriate.

- If both samples have nondetected values (flagged with "U" or "UJ"), the lower value and its flag were used.

- If one sample has a nondetect value (flagged with "U" or "UJ") and the other sample has a detected value (flagged with "J" or unflagged) the following is done:

    - If the detected value is less than or equal to the nondetected value, the detected value and its flag were used; or
    - If the detected value is greater than the nondetected value, the average of detected value and the nondetected value were used. The resulting averaged value was flagged with "J".

- If one sample has a nonrejected value (flagged with "J", "U", "UJ", or unflagged) and one sample has a rejected value (flagged with "R"), the nonrejected value and its flag were used.

The range of detection limits was determined based on the individual sample-specific detection limit (or sample quantitation llmit) for each analyte. Because of sample dilution and/or sample weights, laboratory detection limits for individual samples can be liigher than the method-

specified detection limits. Mininum and maximum sample quantitation limits (SQLs) were determined for each non-detect analyte using the sample's SQL. A number of samples where a constituent was not detected did not have associated detection limits or SQLs reported. These samples were not used in determining the mean or upper confidence of the mean concentrations.

The frequency of detection is the number of samples with detected values per the number of samples analyzed. The number of samples with detected values was determined by totaling all samples with detected values. The number of samples analyzed was determined by totaling all samples with detected or nondetected values (flagged with "U", "UJ", "J" or unflagged). Rejected values (flagged with "R") were not included in the total number of samples analyzed. For field duplicate samples, only one value was used when determining the number of samples analyzed and the number of detected values (as determined using the procedure described above).

2.2.3 PCOPEC Selection

Surface water, sediment and surface soil samphng results collected during previous field investigations on and/or in the vicinity of the Site were evaluated for their frequency of detection and compared with applicable ecological screening benchmarks that are available for each medium. Constituents detected in less than 5 percent of samples were not retained as PCOPECs. For those constituents detected in 5 percent or more of the samples, a comparison of the maximum concentrations of surface water, sediment and surface soil constituents with applicable screening benchmarks was conducted. The maximum concentration of each surface water, sediment and surface soil constituent detected within each sample was compared with its appropriate ecological screening value. If the analyte's detected concentration at any surface water, sediment or surface soil sample exceeds its respective screening value, the constituent was retained as a PCOPEC. In addition, constituents were retained as surface water, sediment and/or surface soil PCOPECs if a screening value was unavailable for that analyte. However, essential nutrients (i.e., calcium, magnesium) were not retained as PCOPECs.

A list of PCOPECs was developed for the different media that included various metals, pesticides, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) that consisted primarily of phthalates and polycyclic aromatic hydrocarbons (PAHs). A summary of the sampling results that present detection frequency, minimum and maximum detected concentrations, minimum and maximum SQLs, arithmetic mean, and Upper Confidence Limit (UCL) of the mean is presented in Appendix B for each medium. A brief synopsis of the PCOPECs retained for each medium is provided below.

Surface Water

A total of five surface water samples were collected from the Hudson Branch adjacent to or downstream of the Site and analyzed for total recoverable metal concentrations. A total of 18 inorganics were detected in one or more of the five samples. Screening benchmarks for these surface water samples were (in decreasing order of preference):

- New Jersey DEP Ecological Screening Criteria for Surface Water (Freshwater aquatic – chronic) (NJDEP, 2010);

- National Recommended Water Quality Criteria (Freshwater – chronic) (USEPA, 2009); and,

- EPA Region lll BTAG Freshwater Screening Benchmarks (USEPA, 2006a).

For metals with hardness-dependent screening benchmarks, the average detected water hardness value (24.25 mg/L) within the Hudson Branch samples was used to calculate the benchmark.

The maximum copeentrations detected in the surface water samples were compared to their applicable ecological screening benchmarks (see Table 2-2). The maximum concentrations of eight inorganics (aluminum, chromium, copper, iron, inanganese, nickel, vanadium and zinc) exceed their respective screening benchmarks and were retained as surface water PCOPECs. The remaining ten detected inorganies (arsenic, beryllium, calcium, cobalt, lead, magnesium, potassium, selenium and sodium) have maximum concentrations less than their respective screening benchmarks. Therefore, these constituents were not retained as surface water PCOPECs.

Sediment

A total of 45 sediment samples were collected from the Hudson Branch either adjacent to or downstream of the facihty. A total of 6 VOCs, 11 SVOCs (including 5 PAHs and 3 phthalates), 3 pesticides (4,4-DDT and its derivatives 4,4-DDD and 4,4-DDE), 3 PCB Aroclors, and 23 inorganics were detected in one or more of the sediment samples. Screening benchmarks for these sediment samples were (in decreasing order of preference):

- New Jersey DEP Ecological Screening Criteria for Sediment (Freshwater Lowest Effect Level) (NJDEP, 2009);

- EPA Region III BTAG Freshwater Sediment Screening Benehmarks (USEPA, 2006a); and,

- Secondary Chronic Values via Equilibrium Partitioning (Jones et al., 1997).

Samplinig results were compared to their applicable ecological screening benchmarks (see Table 2-3). The maximum concentrations of three VOCs (acetone, carbon disulfide, and methylene chloride) and two SVOCs (bis(2-ethylhexyl)phthalate, and phenol) exceed their respective sediment screening benchmarks and were retained as PCOPECs. Benzoic aeid was also retained as a PCOPEC since a sediment screening benchmark for this SVOC is unavailable. The remaining three VOCs and eight SVOCs were detected at low concentrations below their screening values and were eliminated from further evaluation in the SLERA. All three detected pesticides (4,4-DDT and its derivatives) and the three detected PCB Aroclors exceed their sediment benchmarks and were retained as PCOPECs. Each of these contaminants is also a bioaccumulative compound of concem (USEPA, 2000).

All of the inorganics detected in the Hudson Branch except for calcium, magnesium, potassium, silver, sodium and thallium were retained as sediment PCOPECs. The maximum concentrations of aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese,

mercury, nickel, selenium and zinc exceeds their respective screening benchmark. Barium, beryllium and vanadium were also retained as sediment PCOPECs since screening benchmarks are unavailable. Calcium, magnesium, potassium and sodium were not retained as PCOPECs since these elements are essential nutrients. Silver and thallium were eliminated as PCOPECs because these inorganic constituents were infrequently detected (each detected in only 3 percent of the sediment samples). Sediment PCOPECs listed as a bioaccumulative concern are also indicated in Table 2-3.

Surface Soil

A total of 118 surface soil samples were collected from the Site. Constituents detected in the surface soil samples were primarily limited to inorganics as metals represent the main contaminants associated with the Site. A total of 21 inorganics were detected in surface soil samples collected from the former lagoons area while 25 inorganics were detected in surface soil samples collected at both the southern area and Hudson Branch wetlands. Two SVOCs (bis(2-ethylhexyl)phthalate and di-n-butyl phthalate) three PCB Aroclors (1248, 1254 and 1260), and 29 inorganics were detected in soil samples collected from the eastern storage areas.

A comparison of the maximum detected concentrations for each constituent with their respective surface soil screening benchmarks is presented in Table 2-4 for each of the four areas of concern (i.e., former lagoons area, eastern storage areas, southern area and Hudson Branch wetlands). Screening benchmarks for these surface soil samples were (in decreasing order of preference):

- USEPA Ecological Soil Screening Levels (eco-SSLs). The lowest reported concentration for plants, invertebrates, birds and mammals was selected. (USEPA, 2003b and c; 2005a through h; 2006b; 2007a through f; 2008);
- New Jersey DEP Ecological Screening Criteria for Soil. The lowest reported concentration for wildlife PRGs (flora and fauna) and terrestrial plants was selected. (NJDEP, 2009);
- EPA Region 5 RCRA Ecological Screening Levels for Soil (USEPA, 2003a); and,
- Toxicological Benchmarks for Effects on Terrestrial Plants or Soil Invertebrates. The lowest reported concentration was selected (Efroymson et al., 1997a; Efroymson et al., 1997b).

Inorganics and PCB Aroclors 1248 and 1254 were detected at concentrations above their screening benchmarks and were retained as PCOPECs for terrestrial/wetland habitats present at the facility. PCOPECs retained for each of the four areas evaluated in the SLERA (i.e., former lagoons area, eastern storage areas, southern area and Hudson Branch wetlands) are discussed below.

Former Lagoons Area: The maximum detected concentrations of eight inorganics (antimony, chromium, copper, lead, manganese, nickel, vanadium and zinc) exceed their respective soil screening benchmarks and were retained as PCOPECs for the former lagoons area. An additional three inorganics (aluminum, iron and titanium) were retained as PCOPECs since

surface soil ecological screening benchmarks are unavailable for these constituents. Six inorganics (arsenic, barium, beryllium, hexavalent chromium, cobalt and selenium) were eliminated as PCOPECs since their maximum concentrations were detected below their screening values. Calcium, magnesium, potassium and sodium were also eliminated as these inorganics represent essential nutrients.

Eastern Storage Areas: The maximum detected concentrations of PCB Aroclors 1248 and 1254 were detected above the PCB screening benchmark. Therefore, these contaminants were retained as PCOPECs for the eastern storage areas. A total of 13 inorganics (antimony, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, nickel, vanadium and zinc) exceed their respective soil screening benchmarks and were also retained as PCOPECs. An additional five inorganics (aluminum, iron, niobium, strontium and titanium) were retained as PCOPECs since surface soil ecological screening benchmarks are unavailable for these constituents. Three organics (bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, PCB Aroclor 1260) and six inorganics (arsenic, hexavalent chromium, cyanide, mercury, selenium and silver) were eliminated as PCOPECs since their maximum concentrations were detected below their screening values and/or these constituents were detected in less than 5 percent of the samples. In addition, calcium, magnesium, potassium and sodium were eliminated as these inorganics represent essential nutrients.

Southern Area: The maximum detected concentrations of nine inorganics (antimony, chromium, lead, manganese, mercury, nickel, selenium, vanadium and zinc) exceed their respective soil screening benchmarks and were retained as PCOPECs for the southern area of the SMC facility. An additional four inorganics (aluminum, iron, strontium and titanium) were retained as PCOPECs since surface soil ecological screening benchmarks are unavailable for these constituents. Seven inorganics (arsenic, barium, beryllium, boron, hexavalent chromium, cobalt, copper, and silver) were eliminated as PCOPECs since their maximum concentrations were detected below their screening values and/or these constituents were detected in less than 5 percent of the samples. In addition, calcium, magnesiutn, potassium and sodium were eliminated as these inorganics represent essential nutrients.

Hudson Branch Wetlands: The maximum detected concentrations of 14 inorganics (antimony, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, vanadium and zinc) exceed their respective soil screening benchmarks and were retained as PCOPECs for the wetlands associated with the Hudson Branch. An additional three inorganics (aluminum, iron and titanium) were retained as PCOPECs since surface soil ecological screening benchmarks are unavailable for these constituents. Four inorganics (arsenic, hexavalent chromium, silver and thallium) were eliminated as PCOPECs since their maximum concentrations were detected below their screening values and/or these constituents were detected in less than 5 percent of the samples. Calcium, magnesium, potassium and sodium were also elimininated as these inorganics represent essential nutrients.

The average soil pH of the surface soil samples within each of the evaluation areas is unknown as littie to no pH soil sampling results are available. Aluminum may potentially be bioavailable and a contaminant of concem if soil pH is less than 5.5 (USEPA, 2003b) while iron is generally unavailable with a soil pH greater than 5.0 and less than 8.0 (USEPA, 2003c). Both aluminum and iron were retained as PCOPECs as the pH of the surface soils are either unknown (former

lagoon area, eastem storage area and southem area) or within the range where aluminum/iron may be potentially bioavailable/toxic to ecological receptors (Hudson Branch wetlands). PCOPECs that exceeded their respective soil screening criteria or no screening benchmarks are available and considered by the USEPA (2000) to be bioaccumulative were further evaluated by estimating exposure and risk to higher trophic level receptors. Surface soil PCOPECs listed by the USEPA (2000) as compounds of bioaccumulative concem are also provided in Table 2-4.

2.3 CONTAMINANT FATE AND TRANSPORT

Specialty glass manufacturing began at the Site in 1924. SMC purchased the Site in the early 1950s and, from 1955 to approximately 2007, SMC manufactured specialty steel and super alloy additives, primary aluminum master alloys, metal carbides, powdered metals and optical surfacing products at the Site. Some of the metals contained in raw materials used at the facility are: aluminum, barium, bismuth, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel, oxides of niobium, silicon, titanium, vanadium, and zirconium. In the past, oxides of chromium were used at the facility. The Site is currently used as office space and is sublet as warehousing and construction equipment storage space.

Within the SMC Facility, drainage from developed portions of the Facihty is managed via a storm drain system and through overland flow. Most of the drainage from the developed portion of the SMC Facility is directed to the on-site impoundment located in the southwestem portion of the Facility. The drainage from the west portion of the Site) is discharged into a ditch near the westem boundary of the Facility. Stormwater drainage in the eastem undeveloped area of the Site is generally via sheet flow. In the restricted area, the surface mnoff is controlled with berms located to the south and inside the fence.

Historically, the Site had three permitted discharge water outfalls to the Hudson Branch. Following the closure of on-site lagoon features and subsequent to the preparation of the Draft FS Report, the outfalls were revised to reflect current discharge conditions at the Site. Currently, there are two permitted outfalls (DSN004A and DSN001B).

DSN004A is located at the southwest comer of the on-site impoundment in the southwest portion of the SMC Facility. DSN004A receives a combination of facility stormwater and treated water from the on-site groundwater treatment system. When on-site operations were more extensive, non-contact cooling water was also discharged at this location. Flows from DSN004A are recorded at an H-flume located at the outfall.

DSN001B is located at the northwest comer of the on-site impoundment, and is the "tailpipe" of the pump and treat system. The treated groundwater pump and treat system discharge is monitored separately from the discharge at an intemal monitoring point for the treatment system referred to within the NJPDES permh as DSN001B.

The fate and transport of PCOPECs identified at the Site are dependent, in part, upon their physical and chemical properties. Some of these properties important to their fate and transport are solubility, volatility, partition coefficient, biodegradation, and oxidation/reduction.

Potential contaminant release mechanisms at this Site include historic releases of PCOPECs from the SMC facility via contaminated ground water and/or stormwater runoff resulting in the deposition of site-related constituents in the adjacent Hudson Branch. These constituents may either seep into the surface waters of the Hudson Branch or be associated with the sediments (bound to organic or fine particulate matter) of the Hudson Branch. Potential transport mechanisms include the following:

- erosion and transport of contaminant-carrying surface soil by wind, rain, flooding, and melting snow; and,
- leaching of contaminants from contaminated soils and sediments to surface water and ground water.

The primary PCOPECs detected in soils at the Site (metals) have low solubility and low potential to leach into ground water. In general, due to the high partition coefficients of the PCOPECs present at the Site, overland transport via surface water runoff from impacted surface soils and the subsequent sedimentation of particles that contain sorbed PCOPECs into nearby aquatic areas such as the Delaware River is expected to represent the primary transport mechanism at the Site. An additional transport mechanism from the Site surface soils would be associated with wind blown particles that are deposited within nearby terrestrial and/or aquatic habitats. Ground water leaching and transport has a low likelihood of occurrence.

Fate and transport characteristics for the identified PCOPECs are discussed in the following sections pertaining to each group of PCOPECs.

2.3.1 Volatile Organic Compounds (VOCs)

VOCs are expected to disperse very rapidly in air following volatilization from soil. This dispersion, caused by wind and advection, is likely to result in very low exposure point concentrations of VOCs in ambient air. Since VOCs rapidly volatilize from surface soil, contact by terrestrial wildlife to these contaminants in surface soils is expected to be minimal. Additionally, because VOCs have log Kow values less than 3.5, they are unlikely to be taken up and bioaccumulated in plant and biota tissues at significant levels.

2.3.2 Semi-volatile Organic Compounds (SVOCs)

Phthalates (bis(2-ethylhexyl)phthalate): In general, the solubility of this phthalate in water is low with a value of approximately 300 pg/L reported for bis(2-ethylhexyl)phthalate. Due to its high organic carbon/water partition coefficients, this phthalate is expected to adsorb to organic and inorganic particulate materials and have limited bioavailability to biota. USEPA does not consider bis(2-ethylhexyl)phthalate to be a compound of bioaccumulative concern (USEPA, 2000).

2.3.3 Pesticides/PCBs

Pesticides: The pesticides retained as PCOPECs are 4,4-DDT and its derivative which represent chlorinated pesticides. Organochlorine pesticides such as these are very persistent in the

environment and tend to bioaccumulate in both aquatic and terrestrial organisms (USEPA, 1985, 2000). Once acquired, transformation proceeds at a very slow rate due to the complex ring structure and the extent of chlorination. They have a high degree of lipid solubility as characterized by large octanol:water partition coefficients which enables them to concentrate in tissues. Organic carbon partition coefficients are also high which indicates a moderate to strong tendency to adsorb to organic carbon particles. These pesticides generally have low water solubilities, and therefore, are rapidly adsorbed to organic and inorganic particulate material and are not susceptible to leaching.

PCBs: Similar to chlorinated pesticides, these contaminants are also persistent with higher chlorinated congeners more persistent than lower chlorinated congeners. PCBs breakdown slowly in the environment through photolysis and microbial degradation. PCBs tend to bioaccumulate and biomagnify in the environment and are of bioaccumulative concern (USEPA, 2000). Due to their high partition coefficients and low water solubility, PCBs are not very mobile and are usually associated with organic matter found in soil and sediment particles.

2.3.4 Inorganics

Metals are found naturally in the earth's crust in various forms. Metals do not readily degrade in the environment but change (e.g., valence state) form based on characteristics (e.g., pH, organic matter, oxidation/reduction) of the media in which they are found. Metals are persistent in the environment and adhere to soil particles. Most metals are not volatile or very soluble in water. Many of the standard chemical/physical fate and transport mechanisms are not applicable to metals. Some metals such as cadmium and mercury may biomagnify within the food chain although most metals including chromium and vanadium tend to bioaccumulate in lower frophic level organisms.

2.4 ECOTOXICITY LITERATURE REVIEW

The evaluation of mechanisms of ecotoxicity was used to evaluate whether the PCOPECs cause adverse effects and to focus the SLERA on those ecological receptors who may be exposed to PCOPECs through applicable exposure pathways. An ecotoxicity literature review has been performed for selected PCOPECs and is discussed in the following subsections. Aquatic ecotoxicity information is provided for those PCOPECs detected in sediment samples while available wildlife ecotoxicity data is presented for all PCOPECs.

2.4.1 Volatile Organic Compounds (VOCs)

In general, as a group, VOCs are not acutely toxic to most aquatic ecological receptors at very low concentrations. Additionally, most VOCs are generally not highly toxic to wildlife species. For humans, VOCs are mostly a concern because of their carcinogenic effects. For wildlife, toxicity reference values generally do not include carcinogenic endpoints. Since VOCs rapidly volatilize from surface soil, inhalation of VOCs from surface soil by wildlife species should be insignificant. However, at some sites containing high levels of VOCs, this pathway may be significant for burrowing species and may need to be evaluated further if warranted by site-specific conditions.

2.4.2 *Semi-volatile Organic Compounds (SVOCs)*

Benzoic Acid: Data on the toxicity of benzoic acid to ecological receptors including aquatic organisms and wildlife are limited. Testing results presented in ECOTOX indicate concentrations of benzoic acid in surface waters above 100 mg/L may be lethal to various freshwater fishes.

Phthalates: Aquatic life toxicity data indicate that bis(2-ethylhexyl) phthalate (BEHP) is not toxic to aquatic organisms at or below its solubility limit. The solubility of BEHP in water is low with a value of approximately 300 µg/L reported. Due to its high organic carbon/water partition coefficient, BEHP is expected to adsorb to organic and inorganic particulate materials and have limited bioavailability to sediment biota. Therefore, sediment concentrations of BEHP that may result in toxic effects to benthic organisms are very unlikely under natural conditions (Jones et al., 1997).

Significant adverse effects on mice reproduction were noted at diets containing 1000 mg bis(2-ethylhexyl)phthalate (BEHP)/kg during a 105-day study period. Diets containing 100 mg BEHP/kg did not result in adverse reproductive effects to mice (Sample et al., 1996). A four-week study involving feeding ringed doves a diet containing 100 mg BEHP/kg did not observe adverse affects regarding reproduction (Sample et al., 1996).

2.4.3 *Pesticides/PCBs*

DDT: LC_{50} values between 0.2 and 1,230 µg/L have been reported for aquatic invertebrates exposed to DDT and its breakdown products, DDD and DDE (USEPA, 1980). Other 96-hr LC_{50}s, reported in Mayer and Eilersieck (1986), include 1 µg/L for the freshwater amphipod, *Gammarus lacustris*, and 4 pg/L for the isopod, *Asellus brevicaudus*, as well as 70, 10 and 7 pg/L for mosquito larvae (*Culex fatigans* and *Anopheles albimanus*) and stonefly (*Pteronarcys californa*), respectively. The most sensitive freshwater invertebrate reported by Mayer and Ellersieck (1986) was the water flea, *D. pulex*, with a 48-hr EC_{50} of 0.36 µg/L, based on immobilization.

In water, DDT is absorbed by fish directly through the skin, and is also accumulated by invertebrates, which are prey for many fish species. A range of LC_{50} values from 2 to 21 µg/L are given for freshwater fish in Connell and Miller (1984). LC_{50} values for freshwater fish species are also presented in Mayer and Ellersieck (1986). The most sensitive species reported was largemouth hass (*Micropterus salmoides*), with a 96-hr LC_{50} of 1.5 pg/L. Other LC_{50}s reported by Mayer and Ellersieck (1986) were 4.9, 5.0 and 15 µg/L for bluegill sunfish (*L. macrochirus*), black bullhead (*Ictalurus melas*), and channel catfish (*Ictalurus punctatus*), respectively. Chronic effects have been observed at 0.74 pg/L in chronic life-cycle tests with fathead minnows (*P. promelas*) (USEPA, 1980).

Median lethal dietary concentrations in the range of 651 to 1,160 mg/kg have been reported for northern short-tailed shrews (*Blarina brevicauda*) exposed to DDT for up to 17 days via a corn oil diet (Blus, 1978). In studies reported in Klaassen *et al.* (1996), female rats given single DDT doses of 50 mg/kg showed estrogenic effects. Also reported are an LD_{50} of 113 mg/kg for male rats fed DDT, and an LD_{50} of 880 mg/kg for rats fed DDE. At sufficiently high doses, DDT can

induce death in organisms by interfering with central nervous system transmission through the disruption of sodium ion passage (Connell and Miller, 1984).

Acute median lethal dosages for birds include LD_{50}s of >2,240 mg/kg for mallard ducks and 841 mg/kg for Japanese quail (Hudson *et al.,* 1984). Following chronic exposures to DDT dietary concentrations of 100 mg/kg, 50% of exposed adult mallards died in about one year. DDE has been found to cause eggshell thinning in birds consuming a diet containing DDT and its breakdown products. Weimeyer *et al.*, (1970) found 14 to 15% eggshell thinning in American kestrels (*Falco sparverius*) given a daily DDE dietary concentration of 3 mg/kg for less than 7 months. Stendell *et al.* (1989) fed pine voles (*Microtus pinetorum*) from pesticide-contaminated apple orchards to three captive American kestrels. The pine voles contained 48 mg/kg DDE, 3.5 mg/kg DDD, and 14.1 mg/kg DDT. One of the kestrels, which died at 31 days, contained 147 mg/kg DDE in the carcass (wet weight).

PCBs: PCBs have been shown to cause reproductive failure, birth defects, skin lesions, tumors, liver disorders, and death in fish and wildlife (Eisler, 1986a). Due to their high lipid solubility, PCBs bioaccumulate and biomagnify within the food chain. Fish are a major source of PCBs to wildlife. Mink, which consume fish, have been found to be very sensitive to PCBs (Eisler, 1986a). A LOAEL for reproductive effects of 3.425 mg/kg-day was observed in mink exposed to Aroclor-1016 in the diet for 18 months (Aulerich and Ringer, 1980 in Sample et al., 1996). As in mammals, PCBs can severely affect the reproduction of avian piscivores.

Waterfowl may also be impacted by PCB contamination. In a study by Heath *et al.* (in Eisler, 1986a), LD_{50}s for mallards fed Aroclor-1248 and Aroclor-1260 were associated with dietary concentrations of 2,798 mg/kg and 1,975 mg/kg, respectively.

2.4.4 Inorganics

Aluminum: For mammals and birds, evidence suggests that the direct toxic potential of aluminum is low compared to that of many other inorganics; mammals and birds can effectively limit the absorption of aluminum and effectively excrete any excess (Scheuhammer, 1987). Significant accumulation in tissues of mice required dietary doses in excess of 200 mg/kg-day (Scheuhammer, 1987). Oral LD_{50} values for several animal species range from 380 to 780 mg/kg (USEPA, 1985).

There is some evidence of potential toxicity of aluminum in soil to plants, particularly tree seedlings and crops, at low pH (< 5.0) (Kelly *et al.,* 1990). High concentrations of calcium and magnesium and a high organic carbon content in soils have been documented to decrease aluminum toxicity through buffering and complexation, respectively (Kelly *et al.,* 1990; Andersson, 1988).

Antimony: Antimony is a naturally occurring metal that is used in various manufacturing processes. LCVs for antimony exposure to fathead minnow and a daphnid of 1,600 and 5,400 ug/L, respectively, were reported by Kimball (no date in Suter and Tsao, 1996). Antimony is not considered to be a bioaccumulative compound of concern in the environment (USEPA, 2000). Antimony can be toxic to mammals. Testing by Schroeder et al. (1968 in Sample et al., 1996)

showed a chronic oral dose of 5 rhg/L in drinking water caused a reduction in the median life span of female mice.

Barium: Barium readily forms insoluble carbonate and sulfate salts that have low toxicity, but soluble barium salts may be toxic (USEPA, 1985). BCFs for barium in marine animals, plankton and brown algae are 100, 120 and 260, respectively (ATSDR, 1992). Although there is some evidence that barium may bioconcentrate in certain terrestrial plants and aquatic freshwater organisms, the extent of plant uptake and the subsequent uptake by aquatic or terrestrial animals is not known (ATSDR, 1992). Barium is not considered to be a bioaccumulative compound of concern in the environment (USEPA, 2000).

Cuidelines for the pollution classification of Great Lakes harbor sediments classify sediment barium concentrations of <20, 20-60, and >60 mg/kg as non-polluted, moderately polluted, and heavily polluted, respectively (USEPA, 1977 in Beyer, 1990).

Oral LD_{50}s for barium (as barium carbonate) are reported as 418 and 200 mg/kg for rats and mice, respectively (Sax and Lewis, 1989). Exposure of barium chloride to rats via water consumption over a 16-month period resulted in a NOAEL of 5.1 mg/kg-day for effects on growth and hypertension (Perry et al., 1983 in Sample et al., 1996).

Beryllium: LCVs for freshwater daphnids and plants are 5.3 and 100,000 ug/L, respectively (Suter and Tsao, 1996). Beryllium is not considered to be a bioaccumulative compound of concern (USEPA, 2000). A NOAEL for longevity and weight loss in rats of 0.66 mg/kg-d was observed by Schroeder and Mitchner (1975 in Sample et al., 1996) in a study where rats were exposed to beryllium sulfate in drinking water over their lifetime.

Cadmium: The literature review of cadmium effects by Eisler (1985) concluded that freshwater organisms were the most sensitive biota. Concentrations of 0.8 to 9.9 pg/L in water were lethal to several species of aquatic insects, crustaceans, and telcosts. Eisler (1985) also reported that cadmium concentrations ranging from 0.7 to 5.0 µg/L were associated with sublethal effects (decreased growth, inhibited reproduction, and population alterations) in these same groups. Cadmium has also been shown to be highly toxic to South African clawed frog (*Xenopus laevis*) embryos. At the most sensitive embryonic stage, a concentration of 1 mg Cd (II)/L arrested development in 100% of exposed individuals.

Mammals and birds are less sensitive to the biocidal properties of cadmium than freshwater biota (Eisler, 2000). Cadmium in mammals can bioaccumulate and interfere with zinc-containing enzymes, resulting in impairment of kidney function, reproduction, and growth (Scheuhammer, 1987). Cadmium is considered to be a bioaccumulative compound of concern in the environment (USEPA, 2000).

Chromium: Chromium has not been observed to biomagnify and concentrations are usually highest at lower trophic levels (Eisler, 1986b). Chromium (trivalent and total) is not considered to be a bioaccumulative compound of concern (USEPA, 2000). The toxicity of chromium varies widely between organisms and is dependent on form. Adverse effects of chromium to sensitive freshwater species have been documented at 10 pg/L of Cr (VI) and 30 pg/L of Cr (III) (Eisler, 1986b). For wildlife, adverse effects have been reported at 5.1 mg and 10.0 mg of Cr (VI) and

Cr (III), respectively, per kilogram of diet (Eisler, 1986b). These data support the generalization drawn by Eisler (1986b) that Cr (VI) is more toxic to freshwater species and mammals than Cr (III).

Exposure to Cr (VI) has been demonstrated to reduce growth rates in both freshwater algae and duckweed, and to affect the survival and fecundity of cladocerans (Eisler, 1986b). Some salts of chromium are carcinogenic in rats and Cr (VI) is a teratogen in hamsters (USEPA, 1985).

Copper: Mean acute toxicity values for freshwater species range from 7.2 pg/L for the daphnid, *D. pulicaria,* to 10,200 µg/L for bluegill sunfish, *L. macrochirus* (USEPA, 1985). Chronic toxicity values for freshwater species range from 3.9 pg/L for brook trout to 60.4 µg/L for northem pike (USEPA, 1985). Copper is considered to be a bioaccumulative compound of concem in the environment (USEPA, 2000).

Earthworms bioconcentrate copper and can be negatively affected via a decrease in growth, reproduction, or survival (Beyer, 1990). For the soil-dwelling collembolan, *Folsomia fimetaria,* a soil EC_{10} for reproduction of 38 mg/kg, and a soil EC_{10} between 509 and 845 mg/kg for growth (depending on sex and developmental stage). Bysshe (1988) suggested that concentrations of copper in soils will generally kill plants before they can accumulate tissue concentrations that are toxic to grazing animals. However, experimentation has shown that chronic exposure to dietary copper can impact both sheep and swine (USEPA, 1985). Aulerich et al. (1982 in Sample et al., 1996) determined a NOAEL for reproductive effects in mink of 11.7 mg/kg-day.

Iron: The national recommended water quality criterion for iron is 1,000 pg/L. The LCV for fish is 1,300 µg/L (Amelung, 1981 in Suter and Tsao, 1996). This concentration caused 100% morality in an embryo-larval test with rainbow trout exposed to dissolved iron salts. The LCV for daphnids (158 µg/L) is a threshold for reproductive effects from a 21-day test of iron chloride with *D. magna* (Dave, 1984 in Suter and Tsao, 1996). Iron is not considered to be a bioaccumulative compound of concem (USEPA, 2000).

Lead: Lead is toxic to all phyla of aquatic biota (Wong et al., 1978 in Eisler, 1988). Based on a review of toxicity testing literature, Eisler (1988) reported adverse effects to aquatic biota associated with lead concentrations ranging from 1 to 5.1 pg/L. Lead is considered to be a bioaccumulative compound of concem in the environment (USEPA, 2000).

For domestic and laboratory animals, Eisler (1988) reported that survival was reduced at acute oral doses of 5 mg/kg (rat), at chronic oral doses of 5 mg/kg-day (dog), and at dietary doses of 1.7 mg/kg-day (horse). Lead affects the kidneys, bone and cental nervous system in mammals and can have adverse effects on histopathology, neuropsychology, fetotoxicity, growth and reproduction (Eisler, 2000). In addition, lead may interfere with enzymes involved in cellular oxidative processes, and possibly affect the release of impulses at certain nerve endings (Locke and Thomas, 1996). The primary source of lead poisoning in wild waterfowl, and in large raptors that prey on waterfowl, has been the ingestion of shotgun pellets (Locke and Thomas, 1996).

Adverse effects associated with lead in soil have been documented for terrestrial plants (Bysshe, 1988; Eisler, 1988). Earthworms may bioaccumulate lead (Beyer, 1990; Roberts and Dorough,

1985), and high concentrations of lead may be toxic to earthworms, affecting both survival and reproduction. Eisler (1988) generalized that organolead compounds are more toxic than inorganic lead compounds, and that younger organisms are more susceptible than older organisms.

Manganese: Manganese is one of the most abundant trace elements in the lithosphere and is widely distributed in the environment. Manganese is an essential nutrient for both plants and animals. In animals, manganese is associated with growth, normal functioning of the central nervous system, and reproductive function. High levels of manganese may produce neurotoxic responses such as hypoactivity, tremors, and ataxia (USEPA, 2007c). Manganese is not considered to be a bioaccumulative compound of concern in the environment (USEPA, 2000).

Mercury: Mercury is a mutagen, teratogen, and carcinogen, and causes embryocidal, cytochemical, and histopathological effects. Methylmercury can be bioconcentrated in organisms and biomagnified through food chains (Wolfe et al., 1998; Eisler, 1987a). Although inorganic mercury is not considered to be a bioaccumulative compound of concern in the aquatic environment, methylmercury bioaccumulates and biomagnifies into higher trophic levels (USEPA, 2000).

Chronic values for inorganic (or total) mercury are <0.23 µg/L for fish (*P. promelas* through the embryo-larval stage) and 0.96 pg/L for daphnids (*D. magna* in flow-through life-cycle tests) (Call. et al., 1983; Biesinger et al., 1982, respectively, in Suter and Tsao, 1996). The transformation of inorganic mercury by anaerobic sediment microorganisms produces methylmercury (Wolfe et al., 1998). Chronic values for methylmercury are reported as 0.52 µg/L for fish (brook trout in three-generation life-cycle test) and <0.04 µg/L for daphnids (McKim et al., 1976; Biesinger et al., 1982, respectively, in Suter and Tsao, 1996).

As summarized in Sample et al. (1996), reproductive NOAELs for animals exposed to mercury in their diet include 1 mg/kg-day for mink exposed to mercuric chloride for 6 months (Aulerich et al., 1974 in Sample et al., 1996), 0.45 mg/kg-day for Japanese quail exposed to mercuric chloride for 1 year (Hill and Schaffner, 1976 in Sample et al., 1996), 13.2 mg/kg-day for mice exposed to mercuric sulfide for 20 months (Revis et al., 1989 in Sample et al., 1996), and 0.032 mg/kg-day for rats exposed to methyl mercury chloride over 3 generations (Verschuuren et al., 1976 in Sample et al., 1996).

Nickel: LCVs for daphnids, non-daphnid invertebrates, and aquatic plants are <5, 128.4, and 5 ug/L, respectively (Suter and Tsao, 1996). Nickel is considered to be a bioaccumulative compound of concern in the aquatic environment (USEPA, 2000).

Rats fed 40 mg/kg-day of nickel sulfate hexahydrate in their food over 3 generations showed no effects on reproduction (Ambrose et al., 1976 in Sample et al., 1996). The NOAEL for mallards orally exposed to nickel sulfate for 90 days was 77.4 mg/kg-day (Cain and Pafford, 1981 in Sample et al., 1996).

Selenium: In flow-through toxicity studies, selenium, as selenate, was found to reduce larval fathead minnow biomass at 108.1 ug/L (LOEC) and to impair algal and rotifer population growth

rates at similar concentrations. As reported in Suter and Tsao (1996), LCVs for fish, daphnids, and aquatic plants are 88.32, 91.65 and 100 ug/L, respectively.

Regardless of the original source, adverse environmental effects appear to result largely from transfer of selenium from lower to higher trophic levels (Riedel and Sanders, 1996). High bioconcentration and accumulation of selenium from water by numerous species of algae, fish, and invertebrates is well documented at levels of 0.015 to 3.3 ug/kg (Eisler, 1987b). Selenium is considered to be a bioaccumulative compound of concem in the environment (USEPA, 2000).

Came fish populations have suffered reproductive failure after bioaccumulation of selenium from concentrations of about 10 ug/L dissolved selenium (Cumbie and Van Home, 1978 in Riedel and Sanders, 1996). Mortality, gross malformations, and intemal abnormalities of the young of several wetiand bird species have been observed where high selenate concentrations exist (up to 350 ug/L) (Ohlendorf et al., 1986; Ohlendorf et al., 1990 in Riedel and Sanders, 1996). In mammals, selenium is an essential trace element that shows evidence of toxicity at higher doses.

Based on biological effects data compiled from the literature, sediment selenium concentrations of 2.5 mg/kg would be a threshold based on predicted effects, and concentrations of 4.0 mg/kg would be the observed threshold for fish and wildlife toxicity (Van Derveer and Canton, 1997).

Thallium: Information on the toxicity and biological fate of thallium is limited. LCVs for fish, daphnids, and plants are 57, 130, and 100 ug/L, respectively (Suter and Tsao, 1996). The reproductive subchronic LOAEL for male rats orally exposed to thallium sulfate in drinking water for 60 days was 0.74 mg/kg-day (Formigli *et al.*, 1986 in Sample *et al.*, 1996). Thallium is not considered to be a bioaccumulative compound of concem (USEPA, 2000).

Vanadium: Information on the toxicity and biological fate of vanadium is limited. In a study conducted with mallard ducks, individuals were exposed to vanadyl sulfate in their diet for 12 weeks. The NOAEL for mortality, body weight, and blood chemistry was 11.38 mg/kg-day (White and Dieter, 1978 in Sample et al., 1996). Vanadium is not considered to be a bioaccumulative compound of concem in the aquatic environment (USEPA, 2000).

Zinc: Adverse effects of zinc exposure have been documented on the growth, reproduction, and survival of freshwater species of aquatic plants, invertebrates, and vertebrates at concentrations between 10 and 25 µg/L (Eisler, 1993). 96-Hour LC_{50} values for freshwater invertebrates range from 32 to 40,930 µg/L and from 66 to 40,900 pg/L for freshwater teleosts (Eisler, 1993). LCVs for fish, daphnids, non-daphnid invertebrates, and aquatic plants are 36.41, 46.73, >5,243, and 30 µg/L, respectively (Suter and Tsao, 1996). BCF values ranged from 107 to 1,130 for insects and from 51 to 432 for freshwater fish (USEPA, 1980 in Eisler, 1993). Zinc is considered to be a bioaccumulative compound of concem in the aquatic environment (USEPA, 2000).

Varying concentrations of zinc may also affect sediment invertebrates. At a mine tailings site, populations of freshwater oligochaetes and leeches were reduced in numbers of individuals and numbers of taxa in areas where the concentration of zinc in sediment was >20 g/kg (Willis, 1985 in Eisler, 1993).

Reduced survival has been reported for terrestrial plants (sensitive species) and soil invertebrates at soil concentrations of >100 mg/kg and from 470 to 6,400 mg/kg, respectively (Eisler, 1993). Increased dietary zinc has also been shown to have adverse effects on poultry, avian wildlife, livestock and laboratory animals (Eisler, 1993).

2.5 COMPLETE EXPOSURE PATHWAYS

A variety of exposure pathways may potentially affect ecological receptors in the vicinity of the Site. Aquatic organisms such as fish and macroinvertebrates that inhabit the aquatic habitat provided by the Hudson Branch adjacent to and downstream of the Site are directly in contact with PCOPECs present in surface water and sediment and/or potentially feed on organisms residing there. For these aquatic habitats, additional exposure pathways potentially exist to higher trophic level receptors that forage on fish and/or macroinvertebrates present in these areas. Ingestion of bioaccumulative contaminants of concern (USEPA, 2000) present within their prey as well as via incidental sediment ingestion are viable exposure routes for these higher trophic levels.

Portions of the SMC facility itself as well as adjacent downgradient terrestrial/wetland areas are vegetated and provide habitat for a variety of wildlife including herbivorous species such as mourning doves and white-footed mice, insectivorous species such as shrews and American robin as well as carnivorous species including the red-tailed hawk and red fox. These terrestrial receptors may be exposed to PCOPECs present at the Site due to potential ingestion of contaminated plants, invertebrates and small mammals that have bioaccumulated elevated levels of contaminants within their tissues from impacted surface soils. In addition, these receptors may also be exposed to surface soil PCOPECs through incidental ingestion of soil during foraging, grooming or preening activities.

Exposure of biota to subsurface soils and airborne contaminants (through volatization or fugitive dust emissions) via inhalation or dermal contact are not expected to represent as significant a pathway as direct ingestion of contaminated media or ingestion of contaminated biota in the food chain. Ecological receptors are also not anticipated to be directly exposed to groundwater contaminants although the evaluation of surface water and sediment within the adjacent aquatic habitat of the Hudson Branch indirectly evaluates contaminants possibly transported through ground water discharge.

A complete exposure pathway exists if the ecological receptors have contact with the PCOPEC in one or more medium and there is an exposure route (ingestion, direct contact) to the receptor. Organisms most likely to receive potential exposures to site PCOPECs are those whose activities frequently bring them into direct contact with sediment and surface soil or that feed upon species possessing one or both of these characteristics. Species were selected as indicators for exposure evaluation to represent various components of the food chain present in the vicinity of the Site.

2.6 SITE CONCEPTUAL MODEL

The site conceptual model developed for the Site is based primarily on the information previously presented in the above sections concerning the environmental setting, contaminant toxicity as well as fate and transport characteristics, and the complete exposure pathways that

were identified. Figure 2-7 presents a simplified conceptual model for the Site. Primary and secondary ecological receptors and important exposure pathways are identified for both aquatic and terrestrial/wetiand habitats present within the Site.

Past activities associated with the operations at the Site may have resulted in contamination of the aquatic and terrestrial/wetland habitats as represented by the Hudson Branch, former lagoon area, eastem storage areas, southem area, and Hudson Branch wetlands. Important components of the ecological community within these areas include plants, insects and other invertebrates, amphibians, reptiles, birds and mammals that represent a diverse assemblage of feeding guilds. The contaminants detected within the surface water, sediments and surface soils of the Site may potentially affect ecological receptors directly via contact (e.g., benthic community inhabiting contaminated sediments) or they may bioaccumulate within vegetation, invertebrates, and/or small mammals that are subsequently consumed by receptors occupying higher trophic levels within the habitats of the Site.

2.6.1 Assessment Endpoints

Assessment endpoints represent an expression of an ecological attribute that is to be protected. The selection of the assessment endpoints considered the following:

- Existing habitats and species potentially present at the site;
- Contaminants present and their concentrations;
- Modes of toxicity to various receptors by contaminants;
- Ecologically relevant receptors that are potentially sensitive or likely to be highly exposed to life history attributes; and,
- Potentially complete exposure pathways.

Table 2-5 presents the assessment endpoints that were selected for important components of the aquatic and terrestrial/wetland communities identified at or in the vicinity of the Site. The selected assessment endpoints represent both community level endpoints (e.g., benthic macroinvertebrate diversity and productivity) and population level endpoints (e.g., survival, growth and reproduction of particular guilds such as insectivorous birds). The assessment endpoints selected for the SLERA are:

Aquatic Invertebrate Community Diversity and Abundance

Aquatic invertebrates present within the Hudson Branch may be adversely affected by the presence of contaminants within the surface water and the sediment. Concentrations of PCOPECs in the surface water and/or sediment of the Hudson Branch adjacent to and downstream of the SMC facility may result in lower populations or biomass of invertebrates through increased mortality or a reduction in their growth and/or reproduction. The proposed assessment endpoint is:

> Protection of the aquatic invertebrate community from toxic effects that could adversely affect their diversity or abundance through direct exposure to contaminants present within surface water or sediment that are associated with the Site.

Mammalian Aquatic Herbivore Survival, Reproduction, and Growth

Mammalian species associated with the Hudson Branch may forage and consume plants within this aquatic habitat. Aquatic plants may accumulate contaminants within their tissues and be consumed by herbivorous species resulting in potentially toxic effects. In addition, surface water and sediment associated with these aquatic habitats may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of herbivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of vegetation as well as incidental ingestion of contaminated surface water/sediment.

Avian Aquatic Herbivore Survival, Reproduction, and Growth

Avian species associated with the Hudson Branch may forage within or along the aquatic habitat for vegetation. Plants (including seeds/tubers) may accumulate contaminants within their tissues and be consumed by receptor species resuhing in potentially toxic effects. In addition, surface water and sediment associated with these aquatic habitats may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of herbivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of vegetation as well as incidental ingestion of contaminated surface water and sediment.

Semi-Aquatic Avian Insectivore Survival, Reproduction, and Growth

Avian species may forage extensively within or along the aquatic habitat provided by the Hudson Branch for aquatic macroinvertebrates (including recentiy emergent insects such as midges). Aquatic macroinvertebrates may accumulate PCOPECs within their tissues and be consumed by foraging insectivorous species resulting in potentially toxic effects. In addition, surface water associated with the Hudson Branch may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of insectivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of aquatic invertebrates as well as incidental ingestion of contaminated surface water associated with the Site.

Seini-Aquatic Mammalian Insectivore Survival, Reproduction, and Growth

Mammalian species present in the vicinity of the Hudson Branch may forage above or along the aquatic habitats for aquatic macroinvertebrates (particularly on recently emergent insects such as midges/mayflies). Aquatic macroinvertebrates may accumulate PCOPECs within their tissues and be consumed by foraging insectivorous species resulting in potentially toxic effects. In addition, surface water associated with the Hudson Branch may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

Protection of insectivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of aquatic invertebrates that have bioacccumulated contaminants as well as incidental ingestion of contaminated surface water associated with the Site.

Terrestrial Plant Survival and Growth

Vegetation associated with the terrestrial/wetland habitats of the SMC facility are exposed to PCOPECs present within the surface soils of the former lagoon area, eastern storage areas, southern area and the Hudson Branch wetlands. Concentrations of PCOPECs in the surface soil within these areas may result in lower populations or biomass of terrestrial vegetation through increased mortality or a reduction in their growth. The proposed assessment endpoint is:

Protection of terrestrial plants from toxic effects that could adversely affect their survival or growth through exposure to surface soil contaminants associated with the Site.

Avian Terrestrial Herbivore Survival, Reproduction and Growth

Birds present at the Site may forage within the terrestrial/wetland habitats on plants (e.g., leaves, seeds). Vegetation may accumulate PCOPECs within their tissues and be consumed by foraging herbivorous avian species resulting in potentially toxic effects. In addition, surface soils associated with these habitats may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

Protection of herbivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of vegetation as well as incidental ingestion of contaminated surface soils resulting from past operations associated with the Site.

Mammalian Herbivore Survival, Reproduction and Growth

Contaminants present within plants that are growing within the terrestrial/wetland habitats associated with the Site may adversely affect foraging mammalian herbivores. Vegetation may bioaccumulate PCOPECs into their tissues and as the vegetation is subsequently consumed by herbivores foraging within these habitats, toxic effects may occur from PCOPECs. These receptors may also ingest surface soil during their foraging activities. The proposed assessment endpoint is:

Protection of herbivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of vegetation and incidental ingestion of contaminated surface soils resulting from past operations associated with the Site.

Avian Insectivore Survival, Reproduction and Growth

Birds present at the Site may forage within the terrestrial/wetland habitats on various organisms including terrestrial invertebrates (e.g., worms, beetles, ants). Terrestrial invertebrates may accumulate PCOPECs within their tissues and be consumed by foraging insectivorous or

invertivorous avian species resulting in potentially toxic effects. In addition, surface soils associated with these terrestrial/wetland habitats may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of insectivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of terrestrial invertebrates as well as incidental ingestion of contaminated surface soils resulting from past operations associated with the Site.

Mammalian Insectivore Survival, Reproduction and Growth

Mammals present within the Site may forage within the terrestrial/wetiand habitats for terrestrial invertebrates (e.g., worms, beetles, earthworms). Terrestrial invertebrates may accumulate PCOPECs within their tissues and be consumed by foraging insectivorous species resulting in potentially toxic effects. In addition, surface soils associated with the upland areas inay be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of insectivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of terrestrial invertebrates as well as incidental ingestion of contaminated surface soils resulting from past operations associated with the Site.

Avian Carnivore Survival, Reproduction and Growth

Camivorous birds present within the Site may forage within the terrestrial/wetland habitats and consume small mammals that may have accumulated PCOPECs within their tissues. The consumption of these items by foraging camivorous species may potentially result in toxic effects. The proposed assessment endpoint is:

> Protection of camivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of terrestrial vertebrates that have bioacccumulated contaminants resulting from past operations associated with the Site.

Mammalian Carnivore Survival, Reproduction and Growth

Camivorous mammals present within the Site represent tertiary trophic level receptors that may forage within the terrestrial/wetland habitats associated with the Site and consume small mammals that may have accumulated PCOPECs within their tissues. The consumption of these items by foraging camivorous species may result in potentially toxic effects. In addition, surface soils associated with the upland habitats may be incidentally ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of camivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of terrestrial prey that have bioacccumulated contaminants as well as incidental ingestion of contaminated surface soils resulting from past operations associated with the Site.

2.6.2 *Measurement Endpoints*

Measurement endpoints are used to evaluate responses of each assessment endpoint exposed to a stressor (USEPA, 1997). The measurement endpoints proposed for the SLERA are also presented in Table 2-5.

Community-based measurement endpoints were selected for community level assessment endpoints and evaluated via community toxicity values (e.g., surface water quality criteria, sediment benchmarks, vegetation screening values). For population level endpoints that assess receptor guilds present within the exposure areas (as detailed in the site conceptual model), specific indicator species were selected to evaluate potential risks to these guilds.

Specific indicator species selected include the muskrat (*Ondatra zibethicus*), mallard (*Anas platyrhynchos*), tree swallow (*Tachycineta bicolor*), little brown bat (*Myotis lucifugus*), mouming dove (*Zenaida macroura*), white-footed mouse (*Peromyscus leucopus*), American robin (*Turdus americana*), short-tailed shrew (*Blarina brevicauda*), red-tailed hawk (*Buteo jamaicensis*) and red fox (*Vulpes vulpes*).

For the aquatic habitat provided by the Hudson Branch, the muskrat and mallard represent herbivorous receptors while the tree swallow and little brown bat represent insectivorous species that may forage on recently emerged aquatic insects above the Hudson Branch. The muskrat and mallard may also ingest sediment as they forage on vegetation within the Hudson Branch. All four of these indicator species receive addition exposure through ingestion of surface water. The estimated contaminant exposure doses for each of these species will be compared to chronic No Observable Adverse Effect Level (NOAEL) survival, reproductive, or growth effect levels reported in the literature. Exceeding the chronic NOAEL indicates effects are possible.

Herbivorous small mammals and seed-eating birds inhabiting the terrestrial/wetland habitats may indirectiy consume PCOPECs that have accumulated in vegetation as well as directly via ingestion of surface soil. The mouming dove and white-footed mouse were selected to represent these feeding guilds at the Site. Avian and mammalian insectivores represented by the American robin and short-tailed shrew are exposed to surface soil PCOPECs either directly via soil ingestion or indirectly by preying on invertebrates that have accumulated PCOPECs within their tissues. Finally, upper trophic level species such as camivores that are represented by the red-tailed hawk and red fox may be exposed to PCOPECs that accumulate within the tissues of small mammals which are subsequently consumed by these predators. Estimated contaminant exposure doses for each of these indicator species will be compared to chronic NOAEL survival, reproductive, or growth effect levels reported in the literature. An exposure dose that exceeds the chronic NOAEL indicates effects are possible.

For each of the individual indicator species discussed above, the assessment endpoint references an impact on survival, growth or reproduction of a population. Adverse effects on populations can be inferred from measures associated with impaired survival, growth or reproduction.

3.0 ECOLOGICAL EFFECTS CHARACTERIZATION (STEP 1)

The screening-level ecological effects characterization consists of establishing ecological toxicity reference values (TRVs) that represent conservative thresholds for adverse ecological effects consistent with the assessment endpoints for the ecological receptors evaluated in the SLERA. Surface water and sediment quahty criteria or benchmarks were used to assess potential impacts on the aquatic invertebrate community inhabiting the Hudson Branch while soil screening benchmarks associated with adverse effects on terrestrial vegetation were used to evaluate impacts to plants within the terrestrial/wetland habitats. Ecological TRVs were developed to evaluate potential impacts associated with the ingestion of vegetation, invertebrates (both aquatic and terrestrial), small mammals, and surface water/sediment/surface soil by the indicator species selected to represent various foraging guilds of ecological receptors present at the Site.

3.1 SURFACE WATER QUALITY BENCHMARKS

Aquatic invertebrates (as well as other organisms such as fish) present within the aquatic habitats provided by the Hudson Branch may be exposed to surface water contaminants. A comparison of detected constituents within the surface water samples with screening benchmarks protective of aquatic organisms was conducted in the selection of PCOPECs. A total of eight inorganic constituents were detected in the surface water samples above their screening benchmarks. A review of additional toxicity data for these PCOPECs was conducted and included other water quality criteria (e.g., acute criteria), altemative screening values as well as additional effects levels reported in the scientific literature. Available toxicity data include both chronic and acute studies relating to adverse effects to aquatic invertebrates. The surface water TRVs for the aquatic invertebrate community are presented in Table 3-1.

Lowest chronic values for invertebrates (daphnids and nondaphnid invertebrates) were derived from Suter (1996) and represent chronic ambient water quality criteria for invertebrates (based on actual chronic test results with invertebrates) or are estimated based on the available acute toxicity test data (Suter, 1996). Another invertebrate benchmark obtained from Suter (1996) is the test daphid EC20 which represents the highest tested concentration resulting in less than a 20% reduction in the growth, fecundity or survival of daphnids through chronic exposure. The EC20 daphid benehmarks are intended to represent chronic indices of daphnid population production (Suter, 1996). The USEPA Ecotox database was also reviewed to obtain additional toxicity data for various invertebrate species. In addition to the invertebrate-specific TRVs, water quality criteria (acute and chronic) were included as applicable TRVs. The chromium, copper, nickel and zinc criteria were based on the mean water hardness (24.25 mg/L) of the surface water samples collected from the Hudson Branch.

3.2 SEDIMENT QUALITY BENCHMARKS

Aquatic invertebrates present within the aquatic habitats provided by the Hudson Branch may also be exposed to sediment contaminants. A comparison of maximum detected constituents within the sediment samples with screening benchmarks protective of aquatic benthic organisms was conducted in the selection of sediment PCOPECs. A total of 3 VOCs, 3 SVOCs, 3

pesticides, 3 PCB Aroclors, and 17 inorganic constituents were detected in the sediment samples above their screening benchmarks. A review of additional toxicity data for these PCOPECs was conducted and included altemative yet conservative screening values as well as additional effects levels reported in the scientific literature (e.g., probable effect concentrations for inorganic PCOPECs). Sediment TRVs used to evaluate PCOPEC concentrations for their potential to result in adverse effects to benthic organisms inhabiting the Hudson Branch are presented in Table 3-2.

TRVs for sediment PCOPECs primarily include Threshold Effect Concentrations (MacDonald et al., 2000). The Threshold Effect Concentration (TEC) represents a consensus-based freshwater benchmark below which adverse effects on benthic organisms are not expected (MacDonald et al., 2000). TECs essentially reflect the geometric mean of previously published sediment quality benchmarks that were developed as threshold guidelines for predicting toxicity to sediment-dwelling biota. These previously published guidelines include Threshold Effect Levels (TELs from Smith et al., 1996 and USEPA, 1996), Lowest Effect Levels (LELs from Persaud et al., 1993), Effects Range – Low (ER-Ls from Long and Morgan, 1991), and Minimal Effect Thresholds (METs from EC, 1992). The resulting consensus-based TECs were then evaluated to determine their predictive ability to classify sediments as toxic or non-toxic (MacDonald et al., 2000). This evaluation concluded that sediment concentrations below the TECs had a low incidence of sediment toxicity and the TECs present an accurate basis for predicting the absence of adverse effects to benthic organisms inhabiting freshwater sediment (MacDonald et al., 2000).

If a TEC is unavailable for a sediment PCOPEC, then other conservative sediment quality benchmarks were selected. For inorganic PCOPECs, Threshold Effect Concentrations (Ingersoll et al., 1996) associated with effects on 28 day exposure to *Hyalella azteca* (an amphipod) or LELs (Persaud et al., 1993) were used as the sediment TRV. For antimony, an Upper Effect Concentration was used as the TRV since TECs or LELs are not available for this sediment PCOPEC. Sediment TRVs for those organic sediment PCOPECs (i.e., VOCs and SVOCs) that do not have TECs were selected on references (Fuchsman, 2003; Jones et al., 1997) that calculated TRVs based on chronic surface water quality benchmarks and equilibrium partitioning. The mean organic carbon content of the Hudson Branch sediments (10.0 percent) was used to determine the TRVs for these PCOPECs.

In addition to the TEC benchmarks, inorganic sediment PCOPEC TRVs also included a Probable Effect Concentration (PEC), if available. The PEC represents a consensus-based freshwater benchmark above which adverse effects on benthic organisms are expected (MacDonald et al., 2000). Similar to the TECs, the PECs reflect the geometric mean of five previously published sediment quality benchmarks that were developed as guidelines for predicting toxicity to sediment-dwelling biota. These previously published benchmarks include Probable Effect Levels (PELs from Smith et al., 1996 and from Ingersoll et al., 1996), Severe Effect Levels (SELs from Persaud et al., 1993), Effects Range – Median values (ER-Ms from Long and Morgan, 1991), and Toxic Effect Thresholds (TETs from EC, 1992). Similariy, the SEL (Persaud et al., 1993) was used as another sediment TRV for organic PCOPECs and for those inorganic sediment PCOPECs where a PEC is unavailable.

3.3 TERRESTRIAL PLANT BENCHMARKS

TRVs for terrestrial/wetland plants were obtained primarily from available plant soil screening levels presented in USEPA eco-SSL documents. The eco-SSLs for plants were developed by reviewing the available plant toxicity literature and scoring each of nine evaluation criteria (e.g., study design, chronic study, dose-response relationship, etc.). From the studies that met these minimum acceptance criteria, the plant eco-SSL was calculated as the geometric mean of the highest ranked studies (minimum of three studies required). For some PCOPECs, a plant eco-SSL could not be calculated since less than three acceptable studies were identified. In these cases, the toxicity reference value from the highest available study was selected as the plant TRV.

Efroymson et al., (1997a) was used as a secondary source of plant TRVs if a plant eco-SSL was unavailable. This reference conducted a comprehensive review of ecologically-relevant terrestrial plant studies and selected a soil concentration to be used as a screening benchmark for evaluating soil PCOPEC concentrations on terrestrial vegetation. The selected plant TRVs for the selected surface soll PCOPECs are presented in Table 3-3.

3.4 WILDLIFE ECOTOXICITY BENCHMARKS

For the SLERA, USEPA (1997) requires the use of chronic NOAELs as a conservative estimate of ecotoxicity. Because toxicity data for the selected receptor species are generally unavailable, it is necessary to extrapolate toxicity data from other species, usually laboratory test animals. However, the test endpoints for the laboratory species must he significant to the measurement receptor species under field conditions. Endpoints that were considered significant for this risk assessment included adverse effects on growth, reproduction, and survival that are most likely to result in adverse effects to wild populations of receptors. TRVs selected for each PCOPEC for birds and mammals are presented in Tables 3-4 and 3-5, respectively.

The chronic NOAEL, if available for avian and mammalian species, was selected for assessing the effects of exposure by the measurement receptor species. If a chronic NOAEL was unavailable, then the chronic Lowest Observable Adverse Effect Level (LOAEL) reported in the scientific literature was adjusted by an uncertainty factor of 0.2 to derive a TRV equivalent to a chronic NOAEL (Wentsel et al., 1996).

The primary sources of avian and mammalian TRVs were from the TRVs presented in the USEPA eco-SSL guidance documents. Additional sources of TRVs if unavailable in these eco-SSL documents included Sample et al. (1996) and USEPA (2002).

4.0 EXPOSURE CHARACTERIZATION (STEP 2)

Exposure represents the contact (including ingestion) of a measurement receptor with a PCOPEC through the various exposure pathways identified in Section 2.5. Exposure to community measurement receptors (i.e., aquatic invertebrates, terrestrial plants) is simply represented by the concentrations of PCOPECs within the surface water, sediment or surface soil. The surface water, sediment and surface soil PCOPEC concentrations for each sampling location are provided in Appendix A. These concentrations are assumed to represent exposure point concentrations for these community receptors.

Exposure to bioaccumulative PCOPECs via the aquatic and terrestrial food chains are evaluated by modeling exposure to the indicator species or measurement receptors selected for the aquatic and terrestrial/wetland habitats present at the Site. The exposure scenarios developed in the Problem Formulation place measurement receptors within exposure pathways that are most likely to contribute to contaminant intake.

Herbivorous species such as the mallard and muskrat may ingest PCOPECs that have accumulated within Hudson Branch aquatic vegetation. The tree swallow and little brown bat may ingest PCOPECs indirectly via foraging on aquatic insects as they emerge from the Hudson Branch.

The mouming dove and white-footed mouse would be exposed to PCOPECs directly through soil ingestion and indirectly via ingestion of vegetation that is in direct contact with contaminated surface soil. American robins and short-tailed shrews would ingest PCOPECs present in the surface soil as well as through terrestrial invertebrates (i.e., earthworms/insects) that inhabit the Site. The red-tailed hawk and red fox may be exposed to surface soil PCOPECs through consumption of small mammals that have accumulated contaminants through plant or invertebrate uptake. The red fox may also be directly exposed to surface soil PCOPECs through incidental soil ingestion. The purpose of the exposure assessment is to formulate these exposure pathways into algorithms that can predict an estimate of total exposure.

The methods and calculations required for quantification of exposure doses are described within this section. Exposure to contaminants at the site by the selected indicator species is estimated by the following equation:

$$ED = [(SW_{conc} \times SW_{IR})(AUF)(TUF) / BW] + [(S_{conc} \times S_{diet}) + (P_{conc} \times P_{diet}) + (I_{conc} \times I_{diet}) + (SM_{conc} \times SM_{diet})](FIR)(AUF)(TUF) / BW$$

Where:

ED	=	Exposure Dose (mg/kg-body weight-day);
SW_{conc}	=	Surface water contaminant concentration (mg/L);
SW_{iR}	=	Surface water ingestion rate (L/day);
S_{cone}	=	Sediment or Surface Soil PCOPEC concentration (mg PCOPEC/kg);
S_{diet}	=	% of diet sediment or surface soil comprises;
P_{conc}	=	Plant PCOPEC concentration (mg PCOPEC/kg);
P_{diet}	=	% of diet plants (foliage or fruit) comprise;

I_{cone} = Invertebrate (aquatic/terrestrial) PCOPEC concentration (mg PCOPEC/kg);
I_{diet} = % of diet invertebrates (aquatic or terrestrial) comprise;
SM_{conc} = Small mammal PCOPEC concentration (mg PCOPEC/kg);
SM_{diet} = % of diet small mammals comprise;
FIR = Food ingestion rate – dry weight basis (kg/day);
TUF = Temporal use factor (% of year at exposure area);
AUF = Area use factor (% of home range comprised of exposure area); and
BW = Body weight of indicator species (kg).

Dietary information for the selected indicator species was obtained from Sample and Suter (1994), USEPA (1993) and Nagy (2001). Specifically, food ingestion rates, body weights, as well as surface soil/sediment ingestion rates) were obtained from these sources. If necessary, the percent moisture of food items was obtained from USEPA (1993) and Jager (1998) and were used to convert concentrations of food items from wet weight to dry weight. Water ingestion of PCOPECs represents another exposure pathway that is evaluated for each receptor. The model inputs for the selected indicator species are presented in Table 4-1. In accordance with USEPA (1997) guidance, conservative assumptions were used in the SLERA.

4.1 PCOPEC CONCENTRATIONS IN PLANTS

Concentrations of contaminants in vegetation (both aquatic and terrestrial stems/foliage and fruits/seeds) were determined by multiplying the maximum sediment/surface soil concentrations by an appropriate plant uptake factor. The estimated contaminant concentrations within plant tissue were estimated using several sources. Plant uptake factors presented in USEPA eco-SSLs (USEPA 2007g) were used if available. These plant uptake factors are generally based on previous studies where both plant and soil concentrations were reported. These data were then combined and regression was first used to determine an appropriate plant uptake factor. The median plant uptake factor was selected if regression was unsuccessful (based on criteria identified in the eco-SSLs).

A plant uptake factor for mercury was based on a value presented in USEPA (1999) for mercuric chloride. The plant uptake factors for phenol and the PCB Aroclors were calculated based on the regression equation presented in Travis and Arms (1988). This plant uptake factor was developed from paired soil and plant concentration data for 29 organic compounds relating soil-to-plant uptake to an organic compounds octanol-water partition coefficient (K_{ow}). The plant uptake factors and calculated maximum plant tissue concentrations are presented in Table 4-2 for the aquatic habitat provided by the Hudson Branch and Table 4-3 for the terrestrial habitats provided by the former lagoons area, eastern storage areas, southern area and Hudson Branch wetlands.

4.2 PCOPEC CONCENTRATIONS IN AQUATIC INVERTEBRATES

The maximum estimated PCOPEC concentrations in aquatic invertebrates inhabiting the Hudson Branch are derived through the application of a biota:sediment accumulation factor (BSAF) to the maximum PCOPEC concentrations. BSAFs for organic PCOPECs were obtained from the USEPA BSAF Data Set (USEPA, 2007h). The BSAFs represent actual field data collected for nonpolar organic contaminants from 20 locations (primarily Superfund sites). BSAFs were

determined based on sediment contaminant and organic carbon concentrations as well as the lipid content of the aquatic organism. The mean of the reported BSAFs for each PCOPEC was used in the SLERA.

For inorganic PCOPECs, BSAFs determined by Bechtel Jacobs (1998) from previous field and laboratory studies were used, if available. BSAFs are available for the sediment PCOPECs arsenic, cadmium, copper, lead, mercury, nickel and zinc. Conservative values presented in Bechtel Jacobs (1998) that minimize overestimation of invertebrate concentrations were selected for the SLERA. A BSAF for chromium was obtained from USEPA (1999) from previous field and laboratory studies. BSAFs were not available for antimony, barium, beryllium, cobalt, manganese, selenium and vanadium. It was conservatively assumed that the BSAFs for these PCOPECs are 1.0. The maximum estimated aquatic invertebrate PCOPEC concentrations for the Hudson Branch ate presented in Table 4-4.

4.3 PCOPEC CONCENTRATIONS IN TERRESTRIAL INVERTEBRATES

The maximum concentrations of PCOPECs detected within surface soil samples collected from the former lagoons area, eastern storage areas, southern area and Hudson Branch wetland were used to estimate PCOPEC body burdens within invertebrate prey (e.g., insects/earthworms). The BAFs and maximum estimated terrestrial invertebrate PCOPEC concentrations for these four areas of concern are calculated in Table 4-5.

The estimated PCOPEC concentrations within terrestrial invertebrates were estimated using several sources. Bioaccumulation factors (BAFs) for organic PCOPECs were calculated based values for PCBs presented in Sample et al. (1998). For inorganic PCOPECs, BAFs presented in USEPA eco-SSLs (USEPA 2007g) were used if available. The USEPA eco-SSLs used actual BAF ratios (invertebrate tissue:surface soil concentrations) or regression equations relating contaminant concentrations in soil and earthworm tissue (Sample et al., 1998) to estimate conservative burdens of inorganics in terrestrial invertebrates. In general, these body burdens are very conservative in that they represent the upper 95% prediction limit for these metals (Sample et al., 1998). Concentration factors for the remaining inorganics (nickel and mercury) were based on BAFs presented in USEPA (1999). These values generally represent the geometric mean of laboratory studies that determined actual BAFs (USEPA, 1999).

4.4 PCOPEC CONCENTRATIONS IN SMALL MAMMALS

The maximum concentrations of PCOPECs within small mammal tissue were obtained from several sources. Bioaccumulation factor regression equations presented in the USEPA eco-SSLs (USEPA 2007g) were used if available. The inorganic BAFs are based primarily on diet-to-biota biouptake factors developed for beef cattle (Baes et al., 1984). A BAF for mercury (total) was obtained from USEPA (1999). For the organic PCOPECs (PCB Aroclors), a biotransfer factor (BTF) was calculated from the following equation presented in Travis and Arms (1988):

$$BTF = -7.6 + \text{Log } K_{ow}$$

The BTF obtained from Travis and Arms (1988) was then multiplied by the food ingestion rate by an insectivorous small mammal at the Site (short-tailed shrew) to derive the BAF. This BAF

was then multiplied by the maximum surface soil concentration to obtain the PCOPEC concentration within the tissue of the small mammal. The BAFs and estimated maximum PCOPEC concentrations in small mammals within the former lagoon area, eastern storage areas, southern area and Hudson Branch wetlands are presented in Table 4-6.

4.5 EXPOSURE ESTIMATION FOR AVIAN/MAMMALIAN RECEPTORS

The daily dose estimate was calculated for each of the avian/mammalian receptors based on the maximum PCOPEC concentration detected within sediment samples collected from the Hudson Branch and/or surface soil samples collected from the former lagoons area, eastern storage areas, southern area and Hudson Branch wetland. The maximum PCOPEC concentration detected in each environmental medium is a very conservative assessment of exposure since areas where maximum PCOPEC concentrations were detected are unlikely to provide more suitable habitat for the receptors than areas where PCOPEC concentrations were detected at lower concentrations. In addition, it was conservatively assumed that each of the evaluation areas provides the entire foraging area of each receptor species and that each receptor species is present within that portion of the Site year-round.

Sediment and surface soil ingestion rates were calculated by multiplying estimates of sediment/surface soil ingestion found in the literature (expressed as a percentage of total food intake) by the food consumption rate. Exposure factors for each of the 10 receptor species are presented in Table 4-1.

Muskrat

The muskrat is assumed to forage exclusively on aquatic vegetation present within the aquatic habitat of the Hudson Branch throughout the year. A body weight of 1.35 kg and an ingestion rate of 79.4 grams food (dry weight) per day were obtained from the literature (USEPA, 1993; Nagy, 2001). The maximum PCOPEC sediment concentration was used to estimate the aquatic vegetation concentration (Table 4-2). Exposure from surface water and sediment ingestion were also evaluated based on estimated surface water (0.13 L/day) and sediment (2.4% of diet) ingestion rates. The resulting estimated maximum daily doses ingested by the muskrat for each PCOPEC within the aquatic habitat provided by the Hudson Branch are presented in Table 4-7.

Mallard

A body weight of 1.04 kg and an ingestion rate of 74.4 grams food (dry weight) per day were obtained from the literature (USEPA, 1993; Nagy, 2001). The maximum sediment concentration was used to estimate aquatic plant tissue concentrations (Table 4-2). Dietary exposure for the mallard assumes a diet comprised of 100% aquatic vegetation (see Table 4-1). Although the home range of a mallard is estimated to be approximately 274 acres during the breeding season (USEPA, 1993), the mallard is assumed to forage exclusively within the aquatic habitats provided by the Hudson Branch throughout the year. Surface water and sediment ingestion were assumed to be 0.058 L/day and 2% of diet, respectively (USEPA, 1993). The resulting estimated maximum daily doses ingested by the mallard for each PCOPEC within the sediment of the aquatic habitats are presented in Table 4-8.

Little Brown Bat

The little brown bat is assumed to forage exclusively on emerging aquatic invertebrates inhabiting the Hudson Branch adjacent to or downstream of the SMC facility. A body weight of 7.5 grams and an ingestion rate of 1.60 grams food (dry weight) per day were obtained from the literature (Sample and Suter, 1994; Nagy, 2001). The maximum PCOPEC sediment concentration was used to estimate aquatic invertebrate tissue concentrations (Table 4-4). It was assumed that this bat may forage at the site throughout the year (see Table 4-1). Exposure from surface water was also evaluated based on an ingestion rate of 0.001 L/day while sediment ingestion was not evaluated as the little brown bat is assumed not to ingest sediment due to its aerial screening foraging technique. The resulting estimated maximum daily doses ingested by the little brown bat for each PCOPEC within the sediment of the Hudson Branch are presented in Table 4-9.

Tree Swallow

A body weight of 21 grams and an ingestion rate of 11.6 grams food (dry weight) per day were obtained from the literature (USEPA, 1993; Nagy, 2001) indicating that this receptor eats over its weight each day (on a wet weight basis). The maximum PCOPEC sediment concentration was used to estimate emerging aquatic invertebrate tissue concentrations (Table 4-4). Dietary exposure for the tree swallow assumes a diet comprised of 100% emerging aquatic invertebrates (see Table 4-1). It was assumed that the Hudson Branch adjacent to and downstream of the Site provides 100% of the swallow's foraging area. Sediment ingestion is assumed to be negligible for this species as it is an aerial screener and that any grit it ingests is from open non-vegetated upland soils. Exposure from surface water ingestion was also evaluated as PCOPECs were detected in surface water samples collected from the Hudson Branch. The resulting estimated maximum daily doses ingested by the tree swallow for each PCOPEC within the surface water and sediment of the Hudson Branch are presented in Table 4-10.

Mourning Dove

A body weight of 120 grams (0.12 kg) and an ingestion rate of 16.6 grams food (dry weight) per day were obtained from the literature (USEPA, 2007h; Nagy, 2001) for this herbivorous avian species. The maximum PCOPEC surface soil concentration was used to estimate incidental soil ingestion (9.3% of diet) and to estimate plant seed PCOPEC concentrations (Table 4-3). It is assumed that the mourning dove diet is comprised of 100% plant seeds and that this species forages at each of the four evaluation areas associated with the SMC facility year-round (i.e., former lagoon area, eastern storage areas, southern area and Hudson Branch wetlands). It is conservatively assumed that a mourning dove foraging at any of the four evaluation areas ingest surface water entirely from the Hudson Branch. The resulting estimated maximum daily doses ingested by the mourning dove for each PCOPEC within the surface soils of the former lagoons area, eastern storage areas, southern area and Hudson Branch wetland are presented in Table 4-11.

White-footed Mouse

A white-footed mouse body weight of 22 grams (0.022 kg) and an ingestion rate of 3.0 grams food (dry weight) per day were obtained from the literature (Sample and Suter, 1994; Nagy, 2001). Surface water ingestion was estimated at 0.007 L/day (Sample and Suter, 1994). Diet composition of the white-footed mouse was assumed to be 100% vegetation (foliage). The maximum PCOPEC contaminant surface soil concentrations were used to estimate maximum plant concentrations for the former lagoons area, eastern storage area, southern area, and Hudson Branch wetland (Table 4-3) and to calculate a soil ingestion dose based on an estimate of soil ingestion representing 2% of the mouse diet. Surface water ingestion was also evaluated based on a daily ingestion rate of 0.007 L/day (USEPA, 1993) using the same assumptions as discussed above for the mourning dove. The resulting estimated maximum daily doses ingested by the white-footed mouse for each contaminant of concern within the surface soils of the former lagoons area, eastern storage area, southern area, and Hudson Branch wetland are presented in Table 4-12.

American Robin

A body weight of 77 grams (0.077 kg) and an ingestion rate of 9.4 grams food (dry weight) per day were obtained from the literature (USEPA, 1993; Nagy, 2001). The maximum surface soil PCOPEC concentrations for the former lagoons area, eastern storage area, southern area, and Hudson Branch wetland were used to estimate incidental soil ingestion (2.1% of diet) and to estimate terrestrial invertebrate tissue concentrations (Table 4-5). Dietary exposure for the American robin assumes a diet comprised of 100% terrestrial invertebrates. Surface water ingestion was also evaluated based on a daily ingestion rate of 0.011 L/day (USEPA, 1993) using the same assumptions as discussed above for the dove. It was conservatively assumed that a robin would forage at each of the areas of concern throughout the year (see Table 4-1). The resulting estimated maximum daily doses ingested by the American robin for each surface soil PCOPEC within the former lagoons area, eastern storage area, southern area, and Hudson Branch wetland are presented in Table 4-13.

Short-tailed Shrew

The short-tailed shrew is assumed to forage on terrestrial invertebrates present at the Site. A body weight of 15 grams (0.015 kg) and an ingestion rate of 2.0 grams food (dry weight) per day were obtained from the literature (USEPA, 1993; Nagy, 2001). The maximum PCOPEC surface soil concentrations within the former lagoons area, eastern storage area, southern area, and Hudson Branch wetland were used to estimate terrestrial invertebrate concentrations (Table 4-5) and to calculate a soil ingestion dose based on an estimate of soil ingestion representing 13% of the shrew diet. The resulting estimated maximum daily doses ingested by the short-tailed shrew for each PCOPEC within the surface soil at the former lagoons area, eastern storage area, southern area, and Hudson Branch wetland are presented in Table 4-14.

Red-tailed Hawk

A body weight of 1.028 kg and an ingestion rate of 0.117 kg food (wet weight) per day were obtained from the literature (USEPA, 1993; Nagy, 2001) for this carnivorous species. The

maximum PCOPEC surface soil concentrations within the former lagoon area, eastern storage area, southern area, and Hudson Branch wetland were used to estimate small mammal PCOPEC concentrations (Table 4-6). It is assumed that the red-tailed hawk does not ingest soil and that this species forages exclusively at the site year-round (see Table 4-1). The resulting estimated maximum daily doses ingested by the red-tailed hawk for each PCOPEC within the surface soil of the four terrestrial/wetland evaluation areas are presented in Table 4-15.

Red Fox

A body weight of 4.04 kg and an ingestion rate of 0.156 kg food (dry weight) per day were obtained from the literature (USEPA, 1993; Nagy, 2001) for the red fox. The maximum PCOPEC surface soil concenttation was used to estimate small mammal PCOPEC concentrations (Table 4-6) and incidental soil ingestion based on a ingestion rate of 2.4% of the diet (see Table 4-1). It is assumed that the red fox forages exclusively at within each of the four terrestrial/wetland evaluation areas year-round. The resulting estimated maximum daily doses ingested by the red fox for each PCOPEC within the surface soil of the former lagoons area, eastern storage area, southern area, and Hudson Branch wetland are presented in Table 4-16.

5.0 RISK CHARACTERIZATION

Quantitative risk estimates for this SLERA were calculated using the hazard quotient (HQ) approach, which compares the exposure estimates with the applicable ecotoxicity benchmark. The hazard quotient is expressed as the ratio of the exposure estimate, represented by the maximum environmental media concentration (e.g., sediment) or the maximum estimated exposure dose for the wildlife indicator species, to the ecotoxicity benchmark (i.e., TRV).

If the calculated hazard quotient is one or less, then it is unlikely that that PCOPEC will result in an adverse effect on that measurement receptor. Conversely, a hazard quotient greater than one indicates that that particular measurement receptor may be at risk of an adverse effect from that PCOPEC. For the wildlife indicator species, a hazard index (HI) is also calculated based on the sum of the PCOPEC-specific HQs to determine the risk from multiple stressors. It is important to note that HQs provide only a general characterization of potential impacts to the local biota. An HQ less than one is indicative of non-risk, however, an HQ greater than unity does not in itself represent an unacceptable risk. Other site-specific factors (e.g., bioavailability) present at the Site may affect the initial screening calculation. The calculated risk estimates are discussed below.

5.1 AQUATIC MACROINVERTEBRATE COMMUNITY

Risk to the aquatic invertebrate community from the detected PCOPECs within the surface water and sediments of the Hudson Branch were assessed by comparing maximum concentrations of the PCOPECs in surface water and sediment samples with TRV benchmarks generally associated with threshold effects to aquatic biota. The results of these comparisons are discussed below by environmental medium.

5.1.1 Surface Water

Risk to aquatic invertebrates inhabiting the aquatic habitat associated with the Hudson Branch was evaluated. The evaluation compared maximum detected concentrations of surface water PCOPECs within the surface water of the Hudson Branch with aquatic invertebrate toxicity benchmarks (as discussed in Section 3.1). The results of this evaluation are presented in Table 5.1.

The maximum detected concentrations of all eight surface water PCOPECs (aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc) exceed one or more of the aquatic invertebrate community TRVs. Acute and chronic water quality criteria are exceeded by the maximum concentrations of aluminum, copper, vanadium and zinc. Although acute water quality criteria are not exceeded by the maximum detected chromium, manganese or nickel concentrations, the chronic water quality criteria are exceeded by these maximum concentrations as well as by the maximum concentrations of iron (iron does not have an acute criterion).

The maximum detected concentrations of aluminum, chromium, copper, iron, nickel and zinc exceed the lowest chronic value for daphnids and as well as the EC20 reported for daphnids (except for nickel). In addition, the LC50 value for *Hyalella azteca* was exceeded by the maximum detected concentrations of aluminum and zinc. Overall, the elevated surface water

concentrations of these metals are of concem as they can result in chronic (and perhaps acute) adverse impacts to aquatic invertebrates inhabiting the Hudson Branch. All eight of these surface water PCOPECs in the Hudson Branch will be further evaluated in Section 6.

5.1.2 Sediment

Risk to the aquatic invertebrate community from the detected PCOPECs within the sediments of the Hudson Branch were assessed by comparing maximum detected concentrations of the PCOPECs with TRV benchmarks generally associated with threshold effects to benthic biota. The results of this comparison are presented in Table 5-2.

PCOPECs that exceed their respective threshold effect concentrations (TECs) present a potential risk to the benthic macroinvertebrate community inhabiting the Hudson Branch and will be discussed in greater detail in Section 6 (Refinement of PCOPECs or Step 3A of the SLERA). PCOPECs not having TRV benchmarks will also be discussed further in Section 6.

The detected concentrations of three pesticides (4,4'-DDT and its derivatives 4,4'-DDD and 4,4'-DDT), total PCBs, and 13 metals (aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel and zinc) exceed their respective TEC at one or more of the sediment samples from the Hudson Branch collected adjacent to or downgradient of the SMC facility.

The maximum concentrations of the chromium was elevated over two orders of magnitude above its TEC benchmark while the three DDT pesticides, total PCBs (sum of Aroclors 1248, 1254 and 1260), antimony, copper, lead, mercury, and nickel were generally detected an order of magnitude higher than their respective TEC. In addition, each of these PCOPECs were frequently (i.e., greater than 75 percent of samples) at concentrations above its conservative sediment TRV. Therefore, risk associated with each of these PCOPECs will be discussed further in Section 6.

Arsenic, cadmium, iron, manganese and zinc maximum concentrations exceed their conservative screening benchmarks by a factor of 2 to 8 with 20 percent or more of their sample concentrations above their respective sediment TRVs. Therefore, each of these PCOPECs will be further discussed in Section 6.

The maximum concentrations of aluminum and cobalt are approximately equal to their conservative sediment TRVs (i.e., HQs = 1). In addition, only 1 and 4 out of 35 sediment samples analyzed for cobalt and aluminum, respectively, were detected at elevated concentrations greater than their conservative sediment TRVs. Due to the low concentrations detected throughout the Hudson Branch sediments, these PCOPECs were eliminated from further evaluation. Other PCOPECs eliminated include three VOCs (acetone, carbon disulfide, and methylene chloride) and two SVOCs (bis(2-ethylhexyl)phthalate and phenol) as the maximum detected concentrations of these compounds were less than their respective sediment TRV.

Overall, the detected levels of benzoic acid, the pesticide DDT, PCBs and 11 metals within sediments of the Hudson Branch adjacent to or downgradient of the SMC facility exceed their respective TECs indicating sensitive components of the aquatic macrobenthic community within

this aquatic habitat may potentially be adversely affected by these PCOPECs. These analytes will be further assessed in Section 6 (Step 3A).

5.2 SEMI-AQUATIC WILDLIFE RECEPTORS

Table 5-3 presents estimated risks to the herbivorous muskrat and mallard and the insectivorous little brown bat and tree swallow from maximum detected PCOPEC concentrations in the surface water and sediments of the Hudson Branch. The hazard index (sum of hazard quotients for all PCOPECs) ranges from 56 (mallard) to approximately 8,300 (tree swallow). Results for each of the four semi-aquatic receptors are discussed below.

5.2.1 Maminalian Herbivore

The total hazard index is 47 for the muskrat with HQs greater than one calculated for chromium (HQ = 25), antimony (HQ = 14), vanadium (HQ = 2), nickel (HQ = 2), and selenium (HQ = 2). The estimated exposure doses of chromium and antimony ingested by the muskrat are from approximate equal contributions of vegetation and sediment ingestion. Plants contribute 63 and 54 percent, respectively, of the total chromium and antimony exposure dose ingested by the muskrat with the remainder primarily attributable to sediment ingestion. Surface water ingestion contributes less than 0.01 percent of the total chromium and antimony exposure dose received by the muskrat.

Approximately 83 and 56 percent, respectively, of the total vanadium and nickel exposure dose ingested by the muskrat is via sediment ingestion with the remainder associated with ingestion of vegetation. Conversely, plant ingestion provides 96 percent of the total selenium exposure dose ingested by the muskrat. Overall, the inorganic PCOPECs antimony, chromium, nickel, selenium and vanadium present a potential risk to foraging mammalian herbivores within the Hudson Branch and will be evaluated further in Section 6 of the SLERA.

5.2.2 Avian Herbivore

Risks to the herbivorous mallard from maximum detected PCOPEC concentrations in the Hudson Branch sediment samples are presented in Table 5-3. The hazard index (sum of hazard quotients for all PCOPECs) is 56. Risk is primarily driven by vanadium and chromium (HQ = 26 for both). Selenium has a HQ = 1 indicating a very slight risk potential from this PCOPEC as the estimated exposure dose is approximately equal to a dose associated with no observed adverse effects.

Approximately 80 percent of the vanadium exposure dose is due to sediment ingestion by the mallard while 67 percent of the total chromium exposure is due to plant ingestion. The inorganic PCOPECs chromium and vanadium present a potential risk to foraging avian herbivores within the Hudson Branch and will be evaluated further in Section 6 of the SLERA.

5.2.3 Mammalian Insectivore

Table 5-3 also presents estimated risks to the insectivorous littie brown bat from maximum detected PCOPEC concentrations in the Hudson Branch sediment samples. The hazard index

(sum of hazard quotients for all PCOPECs) is 1,400 with HQs greater than one calculated for 13 inorganics. The primary risk drivers are antimony (HQ = 980), vanadium (HQ = 250) and chromium (HQ = 92). Other PCOPECs providing risk include nickel (HQ = 18), selenium (HQ = 11), beryllium (HQ = 9), mercury (HQ = 8), manganese (HQ = 4), barium and copper (HQs = 3), arsenic, cobalt, and zinc (HQs = 2). The total DDT and lead HQs = 1 indicating little risk potential as the total DDT and lead exposure doses ingested by this mammalian insectivore are approximately equal to doses associated with no effects. Therefore, total DDT, lead and the maximum sediment concentrations of phenol, PCB Aroclors 1248, 1254 and 1260 and cadmium (HQs are all less than one) do not present a risk to semi-aquatic mammalian insectivores.

Nearly 100 percent of the PCOPEC ingestion of these risk drivers by the bat is via invertebrate ingestion. The conservative screening assessment concluded that a potential risk exists to semi-aquatic mammalian insectivores foraging at the Hudson Branch from the maximum detected concentrations of 13 inorganics in the sediment. All of these PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

5.2.4 Avian Insectivore

Risks to the insectivorous tree swallow from maximum detected PCOPEC concentrations in the Hudson Branch sediment samples are presented in Table 5-3. The hazard index (sum of hazard quotients for all PCOPECs) is 8,300 with HQs greater than unity calculated for nearly every PCOPEC for which avian toxicity data exists. The only PCOPECs not anticipated to result in risks to avian insectivores are Aroclors 1254 and 1260. The primary risk drivers for the tree swallow are vanadium (HQ = 7,900), chromium (HQ = 220) and mercury (HQ = 130). Other risk drivers include barium (HQ = 18), selenium (HQ = 14), nickel (HQ = 12), copper and lead (HQs = 10), cobalt and zinc (HQs = 5), manganese (HQ = 4), total DDT, Aroclor 1248, and arsenic (HQs = 2).

The tree swallow's exposure to these PCOPECs is nearly 100 percent from aquatic invertebrate ingestion. Overall, a potential risk exists to aquatic avian insectivores foraging at the Hudson Branch from the maximum detected concentrations of total DDT, PCB Aroclor 1248 and 12 inorganics in the sediment. These PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

5.3 TERRESTRIAL/WETLAND PLANT COMMUNITY

Risk to the terrestrial/wetland plant communities from the detected PCOPECs within the surface soil of the former lagoons area, eastern storage areas, southern area and Hudson Branch wetlands were assessed by comparing maximum detected concentrations of the PCOPECs with TRV benchmarks generally associated with threshold effects to vegetation. The results of this comparison are presented in Table 5-4.

PCOPECs that exceed their respective plant TRVs present a potential risk to the vegetation community inhabiting each of the evaluation areas and will be discussed in greater detail in Section 6 (Refinement of PCOPECs or Step 3A of the SLERA). PCOPECs not having TRV benchmarks will also be discussed further in Section 6. Results are discussed below for each of the four terrestrial/wetland evaluation areas.

5.3.1 *Former Lagoons Area*

Maximum detected soil concentrations of vanadium (HQ = 7), nickel (HQ = 5) and manganese (HQ = 2) exceed their respective plant TRVs indicating a potential risk to plants growing near the maximum soil concentration location. Antimony and copper also have maxinium concentrations that slightly exceed their plant TRVs (HQs = 1). The maximum detected concentrations of lead and zinc are less than their respective plant TRVs and are not evaluated further as these PCOPECs are unlikely to affect the plant community within the former lagoons area. Antimony, copper, nickel and vanadium wlll be addressed further in Section 6 of the SLERA (Step 3A).

5.3.2 *Eastern Storage Areas*

The maximum detected soil concentrations of vanadium (HQ = 49), nickel (HQ = 29) and manganese (HQ = 14) are elevated the greatest above theit respective plant TRVs indicating a potential risk to plants. Each of these PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A). In addition, maximum surface soil concentrations of copper (HQ = 5), antimony and lead (HQs = 3), zinc (HQ = 2) and cobalt (HQ = 1) are also above their respective TRVs and will be fiirther evaluated in Section 6. The maximuin defected concentrations of Aroclors 1248 and 1254 as well as barium, berylllum and cadmium are less than their respective plant TRVs and are not evaluated fiirther.

5.3.3 *Southern Area*

Maximum detected soil concentrations of vanadium (HQ = 18), nickel (HQ = 5), zinc (HQ = 3), manganese (HQ = 2), and mercury (HQ = 2) exceed their respective plant TRVs indicating a potential risk to plants growing near the maxinium soil concentration location. Antimony and selenium also have maximum concentrations that slightly exceed their plant TRVs (HQs = 1). The maximum detected concentration of lead is less than its respective plant TRV and is not evaluated further as these PCOPECs are unlikely to affect the plant community within the southern area. Each of the PCOPECs that exceed their plant TRVs will be addressed fiirther in Section 6 of the SLERA (Step 3A).

5.3.4 *Hudson Branch Wetland*

The maximum detected soil concentrations of vanadium (HQ = 120), nickel (HQ = 88) and copper (HQ = 13) are elevated substantially above their respective plant TRVs indicating a potential risk to plants. Each of these PCOPECs will be addressed fiirther in Section 6 of the SLERA (Step 3A). In addition, maximum surface soil concentrations of manganese (HQ = 8), zinc (HQ = 8), cobah (HQ = 7), lead (HQ = 6), and mercury (HQ = 2) are also above their respective TRVs and will be further evaluated in Section 6. Antimony, beryllium and selenium also have maximum concentrations that slightly exceed their plant TRVs (HQs = 1). The maximum detected concentrations of bariuin and cadmium are less than their respective plant TRVs and are not evaluated further. All PCOPECs with maximum surface soil concentrations greater than their plant TRVs will be further evaluated in Section 6 of the SLERA.

5.4 TERRESTRIAL WILDLIFE RECEPTORS

Table 5-5 presents estimated risks to the herbivorous mouming dove and white-footed mouse, the invertivorous American robin and short-tailed shrew, and the camivorous red-tailed hawk and red fox from maximum detected PCOPEC concentrations in the surface soil of the four terrestrial/wetland habitats provided by the former lagoons area, eastem storage areas, southem area and the Hudson Branch wetiand. Results for each of the four evaluation areas are discussed below for each receptor.

5.4.1 *Former Lagoons Area*

The hazard index (sum of hazard quotients for all PCOPECs) ranges from 1 (red fox) to 29 (mouming dove and short-tailed shrew). Results for each of the six terrestrial receptors are discussed below.

5.4.1.1 Avian Herbivores/Granivores

Risks to the herbivorous mouming dove from maximum detected PCOPEC concentrations in the former lagoons area surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 29. Vanadium (HQ = 27) is the only PCOPEC with an HQ greater than one. Nearly all (90 percent) of the vanadium exposure dose is due to surface soil ingestion by the mourning dove. Overall, a potential risk exists to avian herbivores/granivores foraging at the former lagoon area from the maximum detected concentration of vanadium in the surface soil. This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.1.2 Mammalian Herbivores

As presented in Table 5-5, the hazard index (sum of hazard quotients for all PCOPECs) is 3 for the white-footed mouse with no individual PCOPEC having an HQ of one or greater. Risks are unlikely to result to foraging mammalian herbivores within this area. Therefore, no further evaluation to mammalian herbivores is proposed within the former lagoons area.

5.4.1.3 Avian Insectivores/Invertivores

Risks to the invertivorous American robin from maximum detected PCOPEC concentrations in the former lagoons area surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 19 with HQs equal to or greater than unity calculated for vanadium (HQ = 15). Copper (HQ = 1) exposure to the robin is approximately equal to a dose associated with no adverse effects while the maximum HQs for the remaining PCOPECs are below unity indicating that these PCOPECs also do not present a risk to insectivorous birds foraging at the former lagoons area.

Estimated exposure by the American robin to vanadium is via terrestrial invertebrate ingestion (approximately 67 percent) and incidental soil ingestion (33 percent). Overall, a potential risk exists to avian insectivores foraging at the former lagoons area from the maximum detected surface soil concentration of vanadium detected in the surface soil. This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.1.4 *Mammalian Insectivores/Invertivores*

Table 5-5 identifies the estimated risks to the insectivorous short-tailed shrew from maximum detected PCOPEC concentrations in the former lagoons area surface soil samples. The hazard index (sum of hazard quotients for all PCOPECs) is 27 with HQs greater than unity calculated for antimony (HQ = 17), vanadium (HQ = 4), and nickel (HQ = 2). The maximum HQs for chromium and copper were 1 indicating that the modeled exposure dose of chromium and copper are approximately equal to their respective TRVs that are associated with no observable effects. Therefore, it is unlikely that chromium and copper or the remaining PCOPECs (lead, manganese and zinc) present a risk to insectivorous mammals at the former lagoons area.

Estimated exposure by the shrew to antimony is primarily via ingestion of terrestrial invertebrates while surface soil ingestion provides over 85 percent of the nickel and vanadium exposure. Overall, a potential risk exists to mammalian insectivores foraging at the former lagoons area from the maximum detected concentration of antimony, nickel and vanadium detected in the surface soil. Each of these PCOPECs that potentially present risk to mammalian insectivores will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.1.5 *Avian Carnivores*

Risks to the camivorous red-tailed hawk from maximum detected PCOPEC concentrations in the surface soil samples collected from the former lagoons area are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 3. Vanadium (HQ = 2) is the only PCOPEC with an HQ greater than one. Nearly all (97 percent) of the vanadium exposure dose is due to ingestion of small mammals containing vanadium. Overall, a potential risk exists to avian camivores foraging at the former lagoons area from the maximum detected concentration of vanadium in the surface soil. This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.1.6 *Mammalian Carnivores*

Risks to the camivorous red fox from maximum detected PCOPEC concentrations in the former lagoon area surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 1 with no PCOPEC having a calculated HQ above unity. Therefore, there is little risk potential to foraging mammalian camivores from the PCOPECs detected in the surface soils at this area and no further eyaluation to mammalian camivores is proposed within the former lagoons area.

5.4.2 *Eastern Storage Areas*

The hazard index (sum of hazard quotients for all PCOPECs) for the terrestrial receptors foraging at the eastem storage areas ranges from a low of 7 (red fox) to 210 (mouming dove). Results for each of the six terrestrial receptors are discussed below.

5.4.2.1 *Avian Herbivores/Granivores*

Risks to the herbivorous mouming dove from maximum detected PCOPEC concentrations in surface soil samples collected from the eastem storage areas are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 210. Vanadium (HQ = 190) represents the primary risk driver while other PCOPECs having an HQ greater than one include chromium (HQ = 8), lead (HQ = 3), copper (HQ = 2) and nickel (HQ = 2). The maximum HQ for barium was 1 indicating that the modeled exposure dose of this PCOPEC is approximately equal to the TRV that is associated with no observable effects. Therefore, it is unlikely that barium or the remaining PCOPECs (Aroclors 1248 and 1254, cadmium, cobalt, manganese and zinc) present a risk to herbivorous birds at the eastem storage areas.

Nearly all (95 percent) of the vanadium exposure dose is due to surface soil ingestion by the mouming dove while surface soil ingestion also represents the primary mode of exposure to chromium, lead, copper and nickel. Overall, a potential risk exists to avian herbivores/ granivores foraging within the eastem storage areas from the maximum detected concentration of vanadium, chromium, copper, lead and nickel in the surface soil. These PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.2.2 Mammalian Herbivores

Table 5-5 presents estimated risks to the herbivorous white-footed mouse from maximum detected PCOPEC concentrations in the surface soil of the eastem storage area. The hazard index (sum of hazard quotients for all PCOPECs) is 18 with HQs above unity calculated for chromium (HQ = 8), vanadium (HQ = 4), nickel (HQ = 3), antimony (HQ = 2) and beryllium (HQ = 2). The maximum HQs for all of the remaining PCOPECs are below unity indicating that these PCOPECs do not present a risk to mammalian herbivores at the Site.

The majority (greater than 60 percent) of the chromium, antimony and beryllium exposure is via plant ingestion while vanadium exposure is nearly 80 percent attributable to incidental soil ingestion. Nickel exposure is nearly equally divided between plant and soil ingestion. Overall, a potential risk exists to mammalian herbivores from the maximum detected surface soil concentrations of antimony, beryllium, chromium, nickel and vanadium detected at the eastem storage areas. Each of these PCOPECs that potentially present risk to mammalian herbivores will be addressed fiirther in Section 6 of the SLERA (Step 3A).

5.4.2.3 Avian Insectivores/Invertivores

Risks to the invertivorous American robin from maximum detected PCOPEC concentrations in the eastem storage areas surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 150 with most of the risk attributable to vanadium (HQ = 110) and chromium (HQ = 17). Other PCOPECs with HQs greater than unity were calculated for lead (HQ = 7), copper (HQ = 6), PCB Aroclor 1248 (HQ = 3), PCB Aroclor 1254 (HQ = 2), and cadmium (HQ = 2). Zinc (HQ = 1) exposure to the robin is approximately equal to a dose associated with no adverse effects while the maximum HQs for the remaining PCOPECs are below unity indicating that these PCOPECs also do not present a significant risk to insectivorous birds foraging at the eastem storage areas.

Estimated exposure by the American robin to vanadium is via both terrestrial invertebrate ingestion (approximately 67 percent) and incidental soil ingestion (33 percent). However, for the remaining PCOPECs contributing to risk (i.e., PCB Aroclors, cadmium, chromium, copper, and lead), the estimated exposure is almost entirely via terrestrial invertebrate ingestion of PCOPECs (greater than 90 percent of the total exposure dose). Overall, a potential risk exists to avian insectivores foraging at the eastern storage areas from the maximum detected surface soil concentration of PCB Aroclors (1248 and 1254), cadmium, chromium, copper, lead, and vanadium detected in the surface soil. These PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.2.4 Mammalian Insectivores/Invertivores

Table 5-5 identifies the estimated risks to the insectivorous short-tailed shrew from maximum PCOPEC concentrations detected in surface soil samples collected at the eastern storage areas. The hazard index (sum of hazard quotients for all PCOPECs) is 130 with HQs greater than unity calculated for antimony (HQ = 36), vanadium (HQ = 30), chromium (HQ = 17), nickel (HQ = 13), PCB Aroclor 1254 (HQ = 7), copper (HQ = 5), lead (HQ = 4), PCB Aroclor 1248 (HQ = 3), cadmium (HQ = 3), and beryllium (HQ = 2). The maximum HQs for manganese and zinc were 1 indicating that the modeled exposure dose of these two PCOPECs are approximately equal to TRVs that are associated with no observable effects. Therefore, it is unlikely that manganese or zinc or the remaining PCOPECs (barium and cobalt) present a risk to insectivorous mammals at the eastern storage areas.

Estimated exposure by the shrew to PCB Aroclors, antimony and cadmium is mainly through ingestion of terrestrial invertebrates (greater than 85 percent of total exposure) while surface soil ingestion provides over 75 percent of the beryllium, nickel and vanadium exposure. The remaining PCOPECs contributing to risk (i.e., chromium, copper and lead) are ingested by the shrew primarily via terrestrial invertebrate ingestion (greater than 60 percent of total exposure dose) although surface soil ingestion contributes at least 20 percent of the total exposure dose. A potential risk exists to mammalian insectivores foraging at the eastern storage areas from the maximum detected concentration of PCB Aroclors 1248 and 1254, antimony, beryllium, cadmium, chromium, copper, lead, nickel and vanadium detected in the surface soil samples. Each of these PCOPECs that potentially present risk to mammalian insectivores will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.2.5 Avian Carnivores

Risks to the carnivorous red-tailed hawk from maximum detected PCOPEC concentrations in the surface soil samples collected from the eastern storage areas are also presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 17. Vanadium (HQ = 15) is the only PCQPEC with an HQ greater than one. The maximum dose of chromium ingested by the red-tailed hawk is approximately equal to the TRV associated with no adverse effects (HQ = 1). Therefore, it is unlikely that chromium presents a risk to carnivorous birds foraging at the eastern storage areas.

Nearly all (97 percent) of the vanadium exposure dose is due to ingestion of small mammals containing vanadium. Overall, a potential risk exists to avian carnivores foraging at the eastern

storage areas from the maximum detected concentration of vanadium in the surfaee soil. This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.2.6 Mammalian Carnivores

Risks to the carnivorous red fox from maximum detected PCOPEC concentrations in the eastern storage areas surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 6 with HQs greater than unity calculated only for vanadium (HQ = 2). The maximum HQs for chromium and nickel were 1 indicating that the modeled exposure doses of chromium and nickel are approximately equal to their TRVs that are associated with no observable effects. Therefore, it is unlikely that chromium and nickel or the remaining PCOPECs present a risk to carnivorous mammals at the eastern storage areas.

The red fox exposure to vanadium is primarily (approximately 70 percent) via surface soil ingestion. A potential risk exists to mammalian carnivores foraging at the eastern storage areas from the maximum detected concentration of vanadium in the surface soil samples. This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.3 Southern Area

For this portion of the SMC facility, the hazard index (sum of hazard quotients for all PCOPECs) ranges from 2 (red fox) to 74 (mourning dove). Results for each of the six terrestrial receptors are presented in Table 5-5 and are discussed below.

5.4.3.1 Avian Herbivores/Granivores

Risks to the herbivorous mourning dove from maximum detected PCOPEC concentrations in the southern area surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 74. Vanadium (HQ = 71) is the only PCOPEC with an HQ greater than one. Lead (HQ = 1) exposure to the dove is approximately equal to a dose associated with no adverse effects while the maximum HQs for the remaining PCOPECs are below unity indicating that these PCOPECs also do not present a significant risk to herbivorous birds foraging within the southern area.

Nearly all (93 percent) of the vanadium exposure dose is due to surface soil ingestion by the mourning dove. Overall, a potential risk exists to avian herbivores/granivores foraging at the southern area from the maximum detected concentration of vanadium in the surface soil. This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.3.2 Mammalian Herbivores

As presented in Table 5-5, the hazard index (sum of hazard quotients for all PCOPECs) is 5 for the white-footed mouse with vanadium (HQ = 2) representing the only PCOPEC having an HQ of one or greater. Exposure by the mouse to vanadium is primarily via incidental surface soil ingestion (nearly 80 percent of the total exposure dose). This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.3.3 *Avian Insectivores/Invertivores*

Risks to the invertivorous American robin from maximum detected PCOPEC concentrations in the southern area surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 47 with HQs equal to or greater than unity calculated for vanadium (HQ = 41), lead (HQ = 3) and chromium (HQ = 2). Zinc (HQ = 1) exposure to the robin is approximately equal to a dose associated with no adverse effects while the maximum HQs for the remaining PCOPECs are below unity indicating that these PCOPECs also do not present a risk to insectivorous birds foraging at the former lagoon area.

Estimated exposure by the American robin to chromium and lead is almost entirely (greater than 90 percent of the total exposure dose) via terrestrial invertebrate ingestion while vanadium exposure is via terrestrial invertebrate ingestion (approximately 67 percent) and incidental soil ingestion (33 percent). Overall, a potential risk exists to avian insectivores foraging at the southern area from the maximum detected surface soil concentration of chromium, lead and vanadium detected in the surface soil samples. These PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.3.4 *Mammalian Insectivores/Invertivores*

Table 5-5 identifies the estimated risks to the insectivorous short-tailed shrew from maximum detected PCOPEC concentrations in the southern area surface soil samples. The hazard index (sum of hazard quotients for all PCOPECs) is 39 with HQs greater than unity calculated for antimony (HQ = 19), vanadium (HQ = 11), chromium (HQ = 3), nickel (HQ = 2) and zinc (HQ = 2). The maximum HQ for lead was 1 indicating that the modeled exposure dose of lead is approximately equal to the TRV that is associated with no observable effects. Therefore, it is unlikely that lead or the remaining PCOPECs present a risk to insectivorous mammals at the southern area.

Estimated exposure by the shrew to antimony and zinc is via ingestion of terrestrial invertebrates (greater than 85 percent of total exposure dose) while surface soil ingestion provides approximately 80 percent or more of the nickel and vanadium exposure. Chromium exposure to the shrew is both attributable to terrestrial invertebrate ingestion (67 percent of exposure) and surface soil ingestion (33 percent of exposure). A potential risk exists to mammalian insectivores foraging at the southern area from the maximum detected concentration of antimony, chromium, nickel, vanadium and zinc detected in the surface soil samples collected from the southern area. Each of these PCOPECs that potentially present risk to mammalian insectivores will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.3.5 *Avian Carnivores*

The hazard index (sum of hazard quotients for all PCOPECs) is 7 for the carnivorous red-tailed hawk from maximum detected PCOPEC concentrations in the surface soil samples collected from the southern area (Table 5-5). Vanadium (HQ = 5) is the only PCOPEC with an HQ greater than one. Nearly all (99 percent) of the vanadium exposure dose is due to ingestion of small mammals containing vanadium. Overall, a potential risk exists to avian carnivores

foraging at the former lagoon area from the maximum detected concentration of vanadium in the surface soil. This PCOPEC will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.3.6 Mammalian Carnivores

Risks to the camivorous red fox from maximum detected PCOPEC concentrations in the southem area surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 2 with no PCOPEC having a calculated HQ above unity. Therefore, there is little risk potential to foraging mammalian camivores from the PCOPECs detected in the surface soils at this area and no further evaluation to mammalian camivores is proposed within the southem area.

*5.4.4 **Hudson Branch Wetland***

For the delineated wetiands associated with the Hudson Branch, the hazard index (sum of hazard quotients for all PCOPECs) ranges from 27 (red fox) to 750 (short-tailed shrew). Results for each of the six terrestrial receptors are presented in Table 5-5 and are discussed below.

5.4.4.1 Avian Herbivores/Granivores

Risks to the herbivorous mouming dove from maximum detected PCOPEC concentrations in the Hudson Branch wetland surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 550 with vanadium (HQ = 470) and chromium (HQ = 61) contributing most to this potential risk. Other PCOPECs with HQs greater than unity were calculated for lead (HQ = 7), nickel (HQ = 7) and copper (HQ = 4). The maximum HQ for barium was 1 indicating that the modeled exposure dose of barium to the herbivorous dove is approximately equal to the TRV that is associated with no observable effects. Therefore, it is unlikely that barium or the remaining PCOPECs present a risk to avian herbivores/granivores foraging within the Hudson Branch wetiand.

For each of the PCOPECs identified as providing a potential risk to the mourning dove, the exposure is primarily via incidental soil ingestion (soil contribution ranges from 69 to 94 percent of the total exposure dose). Overall, a potential risk exists to avian herbivores/granivores foraging at the Hudson Branch wetland from the maximum detected concentration of chromium, copper, lead, nickel and vanadium in the surface soil. Each of these PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.4.2 Mammalian Herbivores

Table 5-5 presents estimated risks to the herbivorous white-footed mouse from maximum detected PCOPEC concentrations in the surface soil of the Hudson Branch wetland. The hazard index (sum of hazard quotients for all PCOPECs) is 58 with HQs greater than1 calculated for chromium (HQ = 31), vanadium (HQ = 10), nickel (HQ = 9) and beryllium (HQ = 3). The maximum HQ for copper was 1 indicating that the modeled exposure dose of copper to the white-footed mouse is approximately equal to the TRV that is associated with no observable effects. The maximum HQs for all of the remaining PCOPECs are below unity indicating that

these PCOPECs also do not present a risk to mammalian herbivores inhabiting the Hudson Branch wetland.

The majority of the beryllium and chromium exposure is via plant ingestion while surface soil ingestion accounts for the majority of the total exposure dose received by the mouse for nickel and vanadium. A potential risk exists to mammalian herbivores foraging at the Hudson Branch wetland from the maximum detected concentration of beryllium, chromium, nickel, and vanadium detected in the surface soil samples collected from this area. Each of these PCOPECs that potentially present risk to mammalian herbivores will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.4.3 Avian Insectivores

Risks to the invertivorous American robin from maximum detected PCOPEC concentrations in the Hudson Branch wetland surface soil samples are also presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 440 with vanadium (HQ = 280) and chromium (HQ = 130) contributing most to this potential risk. Other PCOPECs with HQs greater than unity were calculated for copper (HQ = 14), lead (HQ = 14), cadmium (HQ = 3), nickel (HQ = 2) and zinc (HQ = 2). The maximum HQs for the remaining PCOPECs are below unity indicating that these PCOPECs do not present a risk to insectivorous birds foraging within the Hudson Branch wetland.

Estimated exposure of cadmium, chromium, copper, lead and zinc is almost entirely (greater than 90 percent of total exposure dose) attributable to ingestion of terrestrial invertebrates while vanadium exposure is via terrestrial inyertebrate ingestion (approximately 66 percent) and incidental soil ingestion (34 percent). Nickel exposure is primarily (87 percent) via incidental surface soil ingestion. A potential risk exists to avian insectivores foraging at the Hudson Branch wetland from the maximum detected concentration of various PCOPECs detected in the surface soil but particularly from chromium and vanadium. Each of the seven PCOPECs potentially presenting risk to avian insectivores will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.4.4 Mammalian Insectivores/Invertivores

Table 5-5 identifies the estimated risks to the insectivorous short-tailed shrew from maximum detected PCOPEC concentrations in the Hudson Branch wetland surface soil samples. The hazard index (sum of hazard quotients for all PCOPECs) is 390 with HQs greater than unity calculated for chromiuni (HQ = 230), vanadium (HQ = 74), nickel (HQ = 40), antimony (HQ = 18), copper (HQ = 14), lead (HQ = 8), cadmium (HQ = 6), beryllium (HQ = 3), and zinc (HQ = 2). The maximum HQs for the remaining five inorganics are below unity indicating that these PCOPECs do not present a risk to insectivorous mammals.

The estimated exposure of antimony, cadmium, and zinc is primarily via ingestion of terrestrial invertebrates (greater than 80 percent of the total exposure dose) while surface soil ingestion accounts for most (greater than 75 percent) of the total exposure dose received by the shrew for beryllium, nickel and vanadium. Both terrestrial invertebrate and soil ingestion are important contributors for exposure to chromium, copper and lead. Overall, a potential risk exists to

mammalian insectivores foraging at the Site from the maximum detected concentration of various PCOPECs detected in the surface soil but particularly from chromium. All of the PCOPECs potentially presenting risk to mammalian insectivores will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.4.5 Avian Carnivores

The hazard index (sum of hazard quotients for all PCOPECs) is 44 for the camivorous red-tailed hawk from maximum detected PCOPEC concentrations in the surface soil samples collected from the Hudson Branch wetland. Vanadium (HQ = 36) and chromium (HQ = 6) are the only PCOPECs with an HQ greater than one. The maximum HQ for lead was 1 indicating that the estimated exposure dose of lead ingested by the red-tailed hawk is approximately equal to the TRV that is associated with no observable effects. The maximum HQs for all of the remaining PCOPECs are below unity indicating that these PCOPECs also do not present a risk to avian carnivores foraging at the Hudson Branch wetland. The vanadium and chromium exposure doses are attributable entirely to ingestion of small mammals. A potential risk exists to avian camivores foraging at the Hudson Branch wetland from the maximum detected concentrations of chromium and vanadium in the surface soil. These two PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

5.4.4.6 Mammalian Carnivores

Risks to the camivorous red fox from maximum detected PCOPEC eoncentrations in the Hudson Branch wetland surface soil samples are presented in Table 5-5. The hazard index (sum of hazard quotients for all PCOPECs) is 16 with chromium (HQ = 7), vanadium (HQ = 5) and nickel (HQ = 3) representing the only PCOPECs having a calculated HQ above unity.

Estimate exposure by the fox to chromium, nickel and vanadium is primarily via incidental surface soil ingestion (soil contribution ranges from 58 to 73 percent of the total exposure dose). All three of these PCOPECs will be addressed further in Section 6 of the SLERA (Step 3A).

6.0 REFINEMENT OF PCOPECS (STEP 3A)

Based on the results of the risk characterization for the aquatic invertebrate community, terrestrial plant community and/or wildlife trophic level receptors selected for the aquatic and terrestrial/wetland habitats present at or adjacent to the SMC Facliity, a number of the contaminants found at concentrations above screening-level concentrations and selected as PCOPECs were eliminated from further consideration. However, under the conservative assumptions presented in the SLERA (Steps 1 and 2) there were several PCOPECs identified that may present a risk to one of more of these assessment endpoints. This refinement of the PCOPECs into a final list of Contaminants of Potential Ecological Concern (COPEC) will be conducted for each of these assessment endpoints using more realistic assumptions to eliminate additional analytes that present negligible risk. Although limited background samples are available for surface water and sediment samples collected from the Burnt Mill Branch, these data are not sufficient for conducting meaningful comparisons between site-related PCOPECs and background concentrations of PCOPECs. Therefore, the SLERA refinement is based on more realistic assumptions and less conservative TRVs.

6.1 AQUATIC INVERTEBRATE COMMUNITY RISK CONSIDERATIONS

A variety of surface water and sediment PCOPECs including benzoic acid, total PCBs, the pesticide 4,4'-DDT (and its derivatives), and 14 inorganics were identified as potentially posing a risk to the aquatic invertebrate community inhabiting the Hudson Branch. Each of these analytes was either detected in surface water or sediment samples at a concentration greater than their TRVs or these analytes do not have a sediment TRV available to compare to the maximum detected sediment concentration. The refinement of surface water and sediment PCOPECs are presented below

6.1.1 Surface Water Risk Considerations

The maximum detected concentrations of aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc detected in the Hudson Branch surface water samples exceed one or more aquatic invertebrate TRVs. A comparison of the mean surface water concentrations of these PCOPECs with their respective aquatic invertebrate TRVs was conducted (Table 6-1). The number of surface water samples that detected each PCOPEC above its respective surface water TRV are also identified in Table 6-1.

The mean detected concentrations of aluminum, chromium, copper, iron, nickel, vanadium and zinc in surface water samples collected from the Hudson Branch exceed one or more of their aquatic invertebrate TRVs. Although the mean manganese concentration is below each of its surface water TRVs, the lowest TRV (Tier II secondary chronic value) is exceeded at two of the five surface water samples collected from the Hudson Branch. Therefore, aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc were identified as COPECs and will be fiirther evaluated in a Baseline Ecological Risk Assessment (BERA).

6.1.2 Sediment Risk Considerations

In order to place exceedences of the TEC benchmarks by sediment PCOPEC concentrations into the context of probable effects, the sediment concentrations of PCOPECs were compared to their respective Probable Effect Concentration (PEC) or Severe Effect Level (SEL). The PEC represents a consensus-based freshwater benchmark above which adverse effects on benthic organisms are expected (MacDonald et al., 2000) and was the preferred sediment TRV for inorganic PCOPECs. PECs reflect the geometric mean of five previously published sediment quality benchmarks that were developed as guidelines for predicting toxicity to sediment-dwelling biota. These previously published benchmarks include Probable Effect Levels (PELs from Smith et al., 1996 and from USEPA, 1996), Severe Effect Levels (SELs from Persaud et al., 1993), Effects Range – Median values (ER-Ms from Long and Morgan, 1991), and Toxic Effect Thresholds (TETs from EC, 1992). If a PEC was not available for an inorganic PCOPEC, then the SEL or ER-M benchmarks were selected. PECs were available for most PCOPECs. For those PCOPECs lacking PECs (iron and manganese), the SEL benchmarks were used to evaluate risk. SELs represent sediment concentrations where significant impacts to the benthic invertebrate community are anticipated. SELs were also selected, if available, for organic sediment PCOPECs. The SELs for organic contaminants are adjusted for the total organic carbon (TOC) content of the sediment as TOC is an important factor in evaluating the bioavailability of sediment organic contaminants. A comparison of maximum detected PCOPEC concentrations with their respective PEC or SEL benchmarks is provided in Table 6-2.

The concentrations of 4,4'-DDT (as well as its derivatives), PCB Aroclors 1248 and 1254, and cadmium were detected below levels associated with probable or severe effects to benthic organisms. Therefore, although adverse effects to sensitive components of the benthic community inhabiting the Hudson Branch adjacent and downgradient of the SMC facility are possible due to sediment PCOPEC concentrations of these constituents that exceed their threshold effect levels, risks are somewhat uncertain as the PCOPEC concentrations are below levels associated with probable effects to the benthic community. A sediment TRV is unavailable for benzoic acid. Benzoic acid is not a bioaccumulative compound of concern. Although not retained as a sediment COPEC, benzoic acid will be discussed in the uncertainty analysis of the SLERA.

An insufficient number of background sediment samples are available for conducting a statistical comparison of the adjacent/downgradient Hudson Branch sampling results with the sediment background sampling results from the Burnt Mill Branch. Therefore, 14 sediment PCOPECs for the aquatic invertebrate community were retained as COPECs for the BERA and included antimony, arsenic, barium, beryllium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, vanadium and zinc.

6.2 SEMI-AQUATIC WILDLIFE RISK CONSIDERATIONS

Potential risks were identified to foraging avian and/or mammalian herbivores (represented by the mallard and muskrat) from maximum detected sediment concentrations of antimony, chromium, nickel, selenium, and vanadium. In addition, avian and/or mammalian insectivores (represented by the tree swallow and little brown bat) are potentially at risk from maximum detected sediment concentrations of total DDT, PCB Aroclor 1248, and 14 inorganics. Less

conservative assumptions were used to re-evaluate potential risks from the sediment PCOPECs by evaluating the mean and the upper confidence limit (UCL) of the mean sediment concentrations (see Table B-3).

Estimated concentrations of PCOPECs within aquatic plants and aquatic invertebrates were calculated using the mean and the UCL of the mean (rather than the maximum concentration) as described previously (see Sections 4.1 and 4.2). The estimated mean and mean UCL aquatic plant and invertebrate tissue concentrations are presented in Tables 6-3 and 6-4, respectively. Estimated exposure doses to the muskrat, mallard, little brown bat and tree swallow based on the mean and the mean UCL sediment concentrations are presented in Tables 6-5 through 6-8, respectively.

The estimated mean and mean UCL exposure doses ingested by the receptor species were compared to avian and mammalian Maximum Acceptable Toxicant Concentration (MATC) TRVs. The MATC TRV represents the geometric mean of the NOAEL and Lowest Observable Adverse Effect Level (LOAEL) TRVs. LOAELs were derived from the same sources as were used to determine the NOAEL TRVs. The avian and mammalian MATC TRVs are presented in Table 6-9.

Table 6-10 presents estimated risks to the herbivorous muskrat and mallard and the insectivorous little brown bat and tree swallow from the mean and mean UCL PCOPEC concentrations in the sediments of the Hudson Branch. Results for each of the four semi-aquatic receptors are discussed below.

6.2.1 Mammalian Herbivore

The mean and mean UCL total hazard indices are 3 and 4, respectively, for the muskrat with HQs greater than one calculated for chromium (HQ = 3 for both the mean and mean UCL exposure doses). The estimated exposure dose of chromium ingested by the muskrat is from approximate equal contributions of vegetation and sediment ingestion. Plants contribute 63 percent of the total chromium exposure dose ingested by the muskrat with the remainder primarily attributable to sedinient ingestion. Chromium presents a potential risk to foraging mammalian herbivores within the Hudson Branch and will be evaluated further in the BERA.

6.2.2 Avian Herbivore

Risks to the herbivorous mallard from mean and mean UCL PCOPEC concentrations in the Hudson Branch sediment samples are presented in Table 6-10. The hazard index (sum of hazard quotients for all PCOPECs) is 6 for the mean exposure dose and 8 for the mean UCL exposure dose. Risk is attributable to chromium and vanadium. Approximately 66 percent of the total chromium exposure is due to plant ingestion. Conversely, 80 percent of the vanadium exposure dose is due to sediment ingestion by the mallard. The oral absorption fraction from sediment ingestion is likely to be very low for vanadium. An oral absorption fraction of 1 percent has been reported previously (USEPA, 2003d). As the majority of the mallard yanadium exposure is via sediment ingestion and the remaining exposure (from plant and surface water ingestion) is well below the avian MATC TRV, impacts to foraging avian herbivores at the Hudson Branch

are not expected. However, chromium presents a potential risk to foraging avian herbivores within the Hudson Branch and will be evaluated further in the BERA.

6.2.3 *Mammalian Insectivore*

Table 6-10 also presents estimated risks to the insectivorous littie brown bat from maximum detected PCOPEC concentrations in the Hudson Branch sediment samples. The hazard index (sum of hazard quotients for all PCOPECs) is 72 for the mean exposure dose and 98 for the mean UCL exposure dose. The primary risk drivers under the mean and mean UCL exposure doses are vanadium (mean HQ = 51) and chromium (mean HQ = 9). The only other PCOPEC providing risk from mean PCOPEC exposure is antimony (HQ = 7). The beryllium and selenium HQs = 1 indicating a slight risk potential as the mean exposure doses of these PCOPECs ingested by the little brown bat are approximately equal to the MATC TRV. Therefore, beryllium, selenium and the mean sediment concentrations of arsenic, barium, cobalt copper, manganese, mercury and zinc (HQs are all less than one) do not present a risk to semi-aquatic mammalian insectivores foraging at the Hudson Branch.

Nearly 100 percent of the PCOPEC ingestion of the identified risk drivers by the bat is via invertebrate ingestion. The SLERA concluded that a potential risk exists to semi-aquatic mammalian insectivores foraging at the Hudson Branch from the mean detected concentrations of antimony, chromium, and vanadium in the sediment. Each of these PCOPECs will be addressed further in the BERA.

6.2.4 *Avian Insectivore*

Risks to the insectivorous tree swallow from mean and mean UCL sediment concentrations in the Hudson Branch are presented in Table 6-10. The hazard index (sum of hazard quotients for all PCOPECs) is 900 under the mean exposure dose and 1,200 under the mean UCL exposure dose with risk driven primarily by vanadium (mean HQ = 850) and chromium (mean HQ = 27). HQs greater than unity were also calculated mean estimated doses of mercury (HQ = 6), barium (HQ = 5), and copper (HQ = 2). The mean estimated exposure dose results in mean HQs = 1 for cobalt, nickel, selenium, and zinc indicating a slight risk potential as the mean exposure doses of these PCOPECs ingested by the tree swallow are approximately equal to their respective MATC TRVs.

The tree swallow's exposure to these PCOPECs is nearly 100 percent from aquatic invertebrate ingestion. Overall, a potential risk exists to aquatic avian insectivores foraging at the Hudson Branch from the mean concentrations of vanadium, chromium, mercury, barium and copper detected in the sediment. These PCOPECs will be addressed further in the BERA.

6.3 TERRESTRIAL PLANT COMMUNITY RISK CONSIDERATIONS

Risk to the terrestrial/wetland plant communities from the detected PCOPECs within the surface soil of the former lagoons area, eastem storage areas, southem area and Hudson Branch wetlands were further assessed by comparing mean UCL concentrations of the retained PCOPECs (see Section 5.3) with TRV benchmarks generally associated with threshold effects to vegetation. In

addition, the frequency that each PCOPEC exceeds its threshold effect concentration was also identified. The results of this analysis are presented in Table 6-11.

PCOPECs that exceed their respective plant TRVs greater than approximately 20 percent may present a potential risk to the vegetation community inhabiting each of the evaluation areas as a ecologically significant component of the community may be affected by PCOPEC concentrations. Results are discussed below for each of the four terrestrial/wetland evaluation areas.

6.3.1 Former Lagoons Area

The detected soil concentrations of copper, manganese, nickel and vanadium exceed their respective plant TRVs at 22 percent or less of the surface soil samples indicating a slight risk to plants growing within the former lagoons area. Antimony was detected at one location greater than the antimony plant TRV. However, sample reporting limits at most of the remaining samples were above its plant TRV. The antimony plant TRV is based on a study that added additional antimony to soil (Efryomson et al., 1997a) which resulted in unspecified effects to plants. There is low confidence in this antimony plant TRV (Efryomson et al., 1997a). Based on the low confidence, antimony was not retained as a COPEC for toxicity to plants. Therefore, no PCOPECs were retained as plant COPECs as adverse effects on the plant community within the former lagoons area are not anticipated.

6.3.2 Eastern Storage Areas

Manganese, nickel and vanadium were detected in surface soil samples above their respective plant TRVs in 58 to 75 percent of the samples. The mean UCL concentrations of vanadium and nickel are elevated approximately 21 and 12 times their respective plant TRVs indicating a potential for adverse effects to occur to the vegetation within the eastern storage areas. The detected soil concentrations of cobalt, copper, lead and zinc were above their respective plant TRVs in only 17 percent or less of the samples indicating a low risk to the plant community. Although antimony was detected above its plant TRV in three sampling locations, as discussed above, the confidence in this plant TRV is low. Manganese, nickel and vanadium concentrations within this area may potentially result in impacts to the plant community and will be evaluated further in the BERA.

6.3.3 Southern Area

Vanadium was detected at concentrations above its plant TRV in 60 percent of the soil samples collected from the southern area at the SMC facility. The remaining PCOPECs were infrequently (i.e., 20 percent or less) above their respective plant TRVs. Although antimony was detected above its plant TRV in four sampling locations, as discussed above, the confidence in this plant TRV is low. Vanadium concentrations within this area may potentially result in impacts to the plant community and will be evaluated further in the BERA.

6.3.4 *Hudson Branch Wetland*

The detected soil concentrations of vanadium and nickel exceed their respective plant TRVs at 58 and 28 percent, respectively, of the soil samples collected within the Hudson Branch wetland. Each of these PCOPECs will be retained as COPECs for further evaluation regarding potential impacts to the wetiand plant community in the BERA. The remaining PCOPECs were infrequently (25 percent or less) above their plant TRVs and were not retained for further evaluation.

6.4 TERRESTRIAL WILDLIFE RECEPTOR RISK CONSIDERATIONS

The estimated exposure models for the terrestrial/wetland indicator receptor species based on the maximum surface soil PCOPEC concentrations detected at the former lagoons area, eastem storage areas, southem area and/or Hudson Branch wetland resulted in HQs greater than 1 for various PCOPECs including PCB Aroclors 1248 and 1254 and nine inorganics (antimony, beryllium, cadmium, chromium, copper, lead, nickel, vanadium, and zinc). Less conservative assumptions were used to re-evaluate potential risks from the surface soil PCOPECs within each of the four terrestrial/wetiand evaluation areas by evaluating the mean and mean UCL surface soil concentrations (see Tables B-5 through B-8).

Estimated concentrations of PCOPECs within plants, terrestrial invertebrates, and small mammals were calculated using the mean UCL (rather than the maximum concentration) as described previously (see Sections 4.1, 4.3, and 4.4). The estimated mean UCL plant, invertebrate and small mammal tissue concentrations are presented in Tables 6-12, 6-13 and 6-14, respectively. The mean UCL exposure doses received by the mouming dove, white-footed mouse, American robin, short-tailed shrew, red-tailed hawk and red fox were then calculated based on the mean and mean UCL soil, plant, terrestrial invertebrate and small mammal concentrations. These exposure doses are provided in Tables 6-15 through 6-20.

Quantitative risk estimates were re-calculated with the hazard quotient (HQ) approach using the mean and mean UCL concentrations and avian and mammalian TRVs based on the MATC (as discussed in Section 6.2). As presented earlier, the MATC represents the geometric mean of the NOAEL and LOAEL TRVs. The MATC HQ (hazard quotient) is expressed as the ratio of the exposure estimate, represented by the mean and mean UCL estimated exposure doses for the six terrestrial/wetland wildlife indicator species, to the ecotoxicity benchmark (i.e., MATC TRV). If the calculated hazard quotient is one or less, then it is unlikely that that PCOPEC will result in an adverse effect on that measurement receptor. This evaluation is presented in Table 6-21 for each of the four terrestrial/wetland habitats evaluated. Results are discussed below for each evaluation area.

6.4.1 *Former Lagoons Area*

A comparison of the maximum estimated exposure doses based on the maximum detected soil concentrations with their respective NOAEL TRVs indicated that vanadium may present a potential risk to foraging avian herbivores, avian/mammalian insectivores and avian camivores while maximum antimony and nickel concentrations may also present a risk to mammalian

insectivores. No PCOPEC was identified as presenting a potential risk to mammalian herbivores or carnivores within the former lagoons area.

The comparison of estimated exposure doses based on the mean and mean UCL soil concentrations with MATC TRVs is presented in Table 6-21. The mean and mean UCL hazard indices for the red-tailed hawk are less than one. Therefore, impacts to avian carnivores foraging at the former lagoons area are not anticipated. The mean hazard index for the short-tailed shrew (mammalian insectivore) is 1 with no individual PCOPEC having a HQ greater than 1. Impacts are unlikely to foraging mammalian insectivores at the former lagoons area.

The mean HQ for the mourning dove from vanadium exposure is 3. Approximately 90 percent of the mourning dove exposure is from surface soil ingestion with the remaining exposure attributed to plant ingestion and surface water ingestion. The oral absorption fraction from soil ingestion is likely to be very low for vanadium. An oral absorption fraction of 1 percent has been reported previously (USEPA, 2003d). As the majority of the mourning dove vanadium exposure is via soil ingestion and the remaining exposure (from plant and surface water ingestion) is well below the avian MATC TRV, impacts to foraging avian herbivores at the former lagoons area are not expected.

A mean HQ of 2 was calculated for the American robin from vanadium exposure. Approximately 33 percent of the robin exposure is via incidental soil ingestion while 65 percent is via terrestrial invertebrate ingestion. Similar to the mourning dove, if the low oral absorption fraction of vanadium is considered from soil ingestion, the remaining exposure dose ingested by the robin (0.96 mg/kg-BW/day) is nearly equal to the avian MATC TRV (0.93 mg/kg-BW-day). As the MATC is believed to represent the upper limit of an acceptable exposure dose, impacts to avian insectivores foraging at the former lagoons area are not likely.

Overall, no PCOPECs were identified for the former lagoons area as providing a potential impact to the terrestrial wildlife receptors. Therefore, impacts to upper trophic level receptors are not considered to be significant at this location.

6.4.2 Eastern Storage Areas

The maximum estimated exposure doses (based on the maximum detected soil concentrations) of PCB Aroclors 1248 and 1254 as well as eight inorganics are elevated when compared to their respective NOAEL TRVs. Vanadium may present a potential risk to foraging avian and mammalian carnivores while this PCOPEC and four to nine additional PCOPECs may present risk to avian/mammalian herbivores and insectivores.

The comparison of estimated exposure doses for the eastern storage areas based on the mean and mean UCL soil concentrations with MATC TRVs is presented in Table 6-21. The mean and mean UCL hazard indices for the red fox are less than one indicating risks to mammalian carnivores are not expected. The mean red-tailed hawk hazard index is 1 based on a vanadium HQ of 1. Impacts to avian carnivores foraging at the eastern storage areas are also not anticipated as the mean estimated exposure dose is approximately equal to the MATC TRV. In addition, the foraging range of a red-tailed hawk is much larger than the size of the eastern storage areas, which would further reduce the overall exposure to the hawk.

The mean and mean UCL hazard indices for the white-footed mouse are 2 and 3, respectively with no individual PCOPEC having an HQ greater than one. Therefore, impacts to mammalian herbivores foraging within the eastern storage areas are not anticipated. The mean hazard index for the mourning dove is 19 with nearly all of the potential risk associated with vanadium (HQ = 18). No other PCOPEC has a HQ greater than 1 for the mourning dove exposure. Exposure to vanadium by the mourning dove is nearly 95 percent attributable to surface soil ingestion. As discussed above, the oral absorption fraction of vanadium is likely to be very low (USEPA, 2003) for soil ingestion. As the estimated exposure from plant ingestion is below the avian MATC TRV, it appears that impacts are unlikely to avian herbivores foraging at the eastern storage areas.

The mean hazard indices for the American robin and short-tailed shrew are 13 and 10, respectively with chromium and vanadium representing the only PCOPECs with HQs greater than 1. The robin exposure to chromium and vanadium is primarily via terrestrial invertebrate ingestion (approximately 90 and 65 percent of the total chromium and vanadium exposure dose, respectively). The short-tailed shrew exposure to chromium is also primarily via terrestrial invertebrate ingestion (67 percent) while incidental soil ingestion accounts for over 75 percent of the total vanadium exposure dose. As the estimated exposure doses ingested by the robin and shrew (even if only considering the invertebrate contribution to their total exposure) exceed the avian and mammalian MATC, a potential risk exists to these feeding guilds and these receptors will be further evaluated in the BERA.

6.4.3 Southern Area

A comparison of the maximum estimated exposure doses with their respective NOAEL TRVs indicated that vanadium may present a potential risk to foraging avian and mammalian herbivores, avian/mammalian insectivores and avian carnivores while maximum antimony, chromium, lead, nickel and zinc concentrations may also present a risk to avian and/or mammalian insectivores. No PCOPEC was identified as presenting a potential risk to mammalian carnivores within the southern area.

The comparison of estimated exposure doses based on the mean and mean UCL soil concentrations with MATC TRVs is presented in Table 6-21. The mean and mean UCL hazard indices for the red-tailed hawk are less than one. Therefore, impacts to avian carnivores foraging within the southern area are not anticipated. The mean hazard index for the short-tailed shrew (mammalian insectivore) is 2 with no individual PCOPEC having a HQ greater than 1. Impacts are also unlikely to foraging mammalian insectivores at the southern area.

The mean HQ for the mourning dove from vanadium exposure is 3. Approximately 88 percent of the mourning dove exposure is from surface soil ingestion with the remaining exposure attributed to plant ingestion and surface water ingestion. As discussed above, the oral absorption fraction from soil ingestion is likely to be very low for vanadium. As the majority of the mourning dove vanadium exposure is via soil ingestion and the remaining exposure (from plant and surface water ingestion) is well below the avian MATC TRV, impacts to avian herbivores foraging at the southern area are not expected.

A mean HQ of 1 was calculated for the American robin from vanadium exposure. Approximately 65 percent is via terrestrial invertebrate ingestion while the remainder is primarily via surface soil ingestion. As the total estimated exposure dose of vanadium ingested by the robin is approximately equal to the avian MATC TRV, impacts are unlikely to occur to avian insectivores foraging within the southern area.

Overall, no PCOPECs were identified for the southern area as providing a potential impact to the terrestrial wildlife receptors and impacts to upper trophic level receptors are not considered to be significant at this location.

6.4.4 Hudson Branch Wetland

The maximum estimated exposure doses of nine inorganics are elevated when compared to their respective NOAEL TRVs. Chromium, nickel, and vanadium may present a potential risk to foraging avian and/or mammalian camivores while these PCOPECs as well as antimony, beryllium, cadmium, copper, lead and zinc may present risk to avian/mammalian herbivores and/or insectivores.

The comparison of estimated exposure doses for the Hudson Branch wetiand based on the mean and mean UCL soil concentrations with the MATC TRVs is presented in Table 6-21. The mean hazard index for the red fox is less than one indicating risks to mammalian camivores are not expected. The mean red-tailed hawk hazard index is 1 with no individual PCOPEC having a HQ greater than 1. Impacts to avian camivores foraging within the Hudson Branch wetland are also not anticipated.

The mean and mean UCL hazard indices for the white-footed mouse are 2 and 7, respectively with chromium representing the only individual PCOPEC having an HQ equal or greater than one (mean HQ = 1). As the total estimated exposure dose of chromium ingested by the mouse is approximately equal to the mammalian MATC TRV, impacts are unlikely to occur to mammalian herbivores foraging within the Hudson Branch wetland.

The mean hazard index for the mouming dove is 15 risk being driven by vanadium (HQ = 11) and chromium (HQ = 4). No other PCOPEC has a HQ greater than 1 for the mouming dove exposure. Exposure to vanadium by the mourning dove is approximately 90 percent attributable to surface soil ingestion. As discussed abcve, the oral absorption fraction of vanadium is likely to be very low (USEPA, 2003d) for soil ingestion. As the estimated exposure from plant ingestion is below the avian MATC TRV, it appears that impacts from vanadium exposure are unlikely to avian herbivores foraging at the Hudson Branch wetland. Similarly, nearly 70 percent of the total chromium exposure dose is attributable to surface soil ingestion. The oral absorption fraction of chromium (trivalent) is extremely low (0.5 percent as presented in USEPA, 2003d). Eliminating the surface soil ingestion component from the dove's total exposure dose results in an exposure dose from terrestrial plants that is approximately equal to the MATC TRV (HQ is 1). Therefore, impacts to avian herbivores are also not anticipated at the Hudson Branch wetland.

The mean hazard indices for the American robin and short-tailed shrew are both 16 with chromium and vanadium representing the only PCOPECs with HQs greater than 1 for both

insectivorous receptors. The robin exposure to chromium and vanadium is primarily via terrestrial invertebrate ingestion (approximately 93 and 66 percent, respectively, of the total chromium and vanadium exposure doses). The short-tailed shrew exposure to chromium is also primarily via terrestrial invertebrate ingestion (67 percent) while incidental soil ingestion accounts for over 75 percent of the total vanadium exposure dose. The oral absorption fraction is very low for vanadium. Accounting for the low availability (one percent) of the surface soil ingestion component of vanadium in the shrew's total exposure dose results in an exposure dose from terrestrial invertebrate ingestion that is less than the MATC TRV. Therefore, impacts to mammalian insectivores are not anticipated at the Hudson Branch wetland from vanadium exposure. However, as the estimated exposure dose of chromium and vanadium ingested by the robin and the estimate exposure dose of chromium ingested by the shrew exceed the avian and mammalian MATCs, a potential risk exists to these feeding guilds and these receptors will be further evaluated in the BERA.

6.5 UNCERTAINTY

There are considerable uncertainties associated with estimates of risk in any SLERA, as the risk estimates are based on a number of assumptions regarding exposure and toxicity. There is uncertainty associated with the site conceptual model, with natural variation and parameter error, and with model error (USEPA, 1997). A thorough understanding of the uncertainties associated with risk estimates is critical to understanding predicted risks and placing them in proper perspective.

Uncertainty associated with the conceptual model (Figure 2-1) includes assumptions about the sources of contaminants and the fate and transport of the contaminants at the SMC facility. There is some uncertainty in the selection of the receptors as representative of communities utilizing the terrestrial and aquatic habitats at or in the vicinity of the SMC facility. Habitat quality for some of the receptor species appears marginal within portions of the SMC facility and will influence actual presence or exposure of species or communities within the different portions of the exposure areas. For example, the mouming dove was selected as an herbivorous bird that is likely to inhabit or forage within the terrestrial habitats present at the Site. The assumption that the mouming dove uses this area throughout the year likely overestimated the exposure to surface soil PCOPECs to herbivorous birds. Therefore the calculated risk to mouming dove populations is associated with some uncertainty.

6.5.1 Exposure Estimation

Exposure estimates for indicator species are a source of uncertainty in the SLERA. Values for exposure parameters (*e.g.*, body weight, food intake rate, sediment ingestion rate) were based on literature values, not site-specific data. The estimation of contaminant body burdens in terrestrial invertebrates was based on soil regression equations developed for earthworms that are in far greater contact with surface soil than would be the prey items (e.g., insects) that are also ingested by insectivorous species such as American robins or short-tailed shrews. However, the approach maintained in the SLERA was to utilize conservative exposure parameters while maintaining a realistic evaluation of the potential for risk.

The bioaccumulative potential of plants varies among species, and even within different parts of the plant. Therefore, there are additional uncertainties in assuming tissue concentrations from whole plants are representative of the exposure of a consumer, particularly for a species that might selectively graze on a specific species or part of a plant.

A major source of uncertainty associated with evaluating the aquatic habitat provided by the Hudson Branch is that the surface water samples were collected in 1995 and are not representative of recent or current conditions within this stream. The concentrations of inorganic constituents detected in the 1995 surface water samples represent total recoverable metal concentrations which likely overestimate their bioavailability and potential risk to aquatic receptors inhabiting the Hudson Branch. The dissolved metal concentration more accurately represents the bioavailable portion of these constituents to aquatic receptors.

In general, there is confidence that data collected for the SLERA represent the types and distributions of sediment and surface soil contaminants within the terrestrial and aquatic habitats present at or in the vicinity of the Site. Conservative assumptions were also made about exposure duration and site use factors. In particular, maximum exposure scenarios are very conservative, as they assume the highest sample concentrations for a contaminant was spread evenly over the entire range of an organism's residence or foraging range. With the exception of some benthic invertebrates, this assumption is very conservative, because the wildlife receptor species would not likely be confined to an area representative of a single sample within the exposure areas. Consequently, maximum exposure estimates for most of the initial models are worst-case scenarios that tend to grossly overestimate exposure. Mean and mean UCL concentrations presented in Step 3A of the ecological risk assessment use more realistic exposure point concentrations for the receptors, particularly wildlife receptors that forage throughout their home range.

6.5.2 Toxicological Data

Toxicity values for indicator species and communities were based on literature values. As is the case for literature-based exposure parameter values, this is a major source of uncertainty in the SLERA. The sensitivity of receptors in the exposure areas associated with the Site may be different than the sensitivity of species used in tests reported in the literature. Surface water samples collected from the Hudson Branch include only total recoverable metals. For most metals, the dissolved concentration represents the bioavailable portion for ecological receptors. Therefore, the risks to biota exposed to surface water PCOPECs are likely to be overestimated by the total metal concentrations detected in surface water samples.

Vanadium was detected at high concentrations in sediment samples collected in the Hudson Branch adjacent to and downgradient of the SMC facility. It is possible that elevated levels of vanadium may adversely affect benthic organisms. Currently, there is not a sediment benchmark available for vanadium that can be used to evaluate potential risk to benthic invertebrates. Therefore, there is uncertainty associated with the potential risk to these receptors from the detected concentrations of vanadium within the sediments of the Hudson Branch. Similarly, other constituents detected in sediment including benzoic acid, barium, beryllium and selenium do not have a sediment benchmark for evaluating potential risks to benthic invertebrates. Therefore, there is uncertainty regarding the effects of these PCOPECs on benthic organisms.

An uncertainty associated with evaluating effects to terrestrial plants is the lack of effect concentrations from PCOPECs to vegetation. In particular, chromium was detected at high concentrations within surface soil samples collected from several of the terrestrial habitats evaluated in the SLERA. A plant TRV associated with trivalent (or total) chromium is not available. The effects of the elevated chromium concentrations on the terrestrial/wetland plant communities are uncertain.

Assumptions about the equality of contaminant form between laboratory tests and site field conditions must also be made in the absence of speciation analyses. This is a source of uncertainty, since toxicity may vary with the form of the toxicant in the environment. Thus, the actual toxicities of PCOPECs evaluated in this SLERA could be higher or lower than indicated by the TRVs used in the development of HQs. One of the largest sources of uncertainty in all of these TRV values is the form of the chemical used to determine the laboratory exposure. The HQ approach uses the assumption that the absorption of the chemical from the diet will be the same as the absorption of the chemical in the form used in the laboratory. Often this assumption is very conservative, because absorption of metals ingested with sediment or plant material, is greatly reduced from forms given in laboratory studies.

7.0 SUMMARY

The initial benchmark screening resulted in the selection of 8 surface water PCOPECs (aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc), 29 PCOPECs in sediment (3 VOCs, 3 SVOCs, 3 pesticides, 3 PCB Aroclors, and 17 inorganics) and 23 PCOPECs in surface soil (PCB Aroclors 1248 and 1254 and 21 inorganics) for evaluation in the SLERA. Four indicator species and one indicator community were selected to evaluate risks associated with exposure to the PCOPECs in the surface water and sediment samples collected from the Hudson Branch adjacent to or downgradient of the SMC facility while six indicator species were selected to evaluate surface soil PCOPECs within four terrestrial/wetland areas located at or downgradient of the SMC facility. Endpoints in the SLERA were selected to represent ecological attributes that are to be protected (assessment endpoints) and a measurable characteristic of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has or may occur. If the maximum surface water, sediment or surface soil PCOPEC concentration resulted in exceeding the lower benchmark TRV (e.g., TEC or NOAEL TRV), the contaminant was concluded to pose a risk to populations and the PCOPEC was evaluated further.

A summary of the findings evaluated in the SLERA (including Step 3A) is presented in Table 7-1. Based on the analysis of the five selected indicators/endpoints in the SLERA for the aquatic habitat provided by the Hudson Branch, the results suggest that surface water concentrations of aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc and sediment concentrations of chromium, copper, lead, mercury, nickel and zinc may pose a potential risk to the aquatic invertebrate community present within the Hudson Branch. In addition, avian/mammalian herbivores (represented by the mallard and muskrat) are potentially at risk from sediment concentrations of chromium that may bioaccumulate within aquatic vegetation. Mammalian insectivores (represented by the little brown bat) may be at risk from the modeled concentrations of antimony, chromium and vanadium within the tissues of aquatic invertebrates that may be consumed by foraging bats. Avian insectivores (represented by the tree swallow) are potentially at risk from sediment concentrations of barium, chromium, copper, mercury and vanadium that may bioaccumulate in aquatic invertebrates. In summary, COPECs retained for the aquatic habitat provided by the Hudson Branch that require further evaluation include aluminum, antimony, barium, chromium, copper, iron, lead, manganese, mercury, nickel, vanadium and zinc.

A total of 12 inorganic PCOPECs were identified as potentially providing risk to the vegetation communities present at the former lagoons area, eastern storage areas, southern area and/or the Hudson Branch wetland. The frequency of these PCOPECs that were detected above the plant TRVs was subsequently evaluated to determine whether potential area-wide effects to the vegetation community are possible. The surface soil concentrations of manganese, nickel and vanadium at the eastern storage areas and the concentrations of vanadium in surface soils of the southern area and Hudson Branch wetland may present a potential risk to the plant communities inhabiting these areas. Manganese, nickel and vanadium were retained as COPECs requiring further evaluation regarding potential impacts to the plant communities within these respective areas.

Analysis of the maximum exposure assessment for terrestrial wildlife indicator species foraging at the former lagoons area, eastern storage areas, southern area and the Hudson Branch wetland

using conservative exposure assumptions indicated HQs equal or greater than 1 based on NOAEL TRVs for PCB Aroclors and nine inorganics (antimony, beryllium, cadmium, chromium, copper, lead, nickel, vanadium and zinc) to foraging herbivores, insectivores and carnivores. A refinement of the selected PCOPECs was subsequently conducted using mean and mean UCL surface soil concentrations and less conservative TRVs (MATCs representing the geometric mean of the selected NOAEL and LOAEL TRVs).

COPECs were not identified for the former lagoons area and the southern area as risks are not expected to occur to the avian/mammalian receptor species inhabiting these areas. The surface soil concentrations of chromium and vanadium may present a risk to avian and mammalian insectivores (represented by the American robin and short-tailed shrew) that forage at the eastern storage areas. Therefore, chromium and vanadium were retained as COPECs for the eastern storage area and will be evaluated further. Surface soil concentrations of chromium may pose a risk to foraging avian and mammalian insectivores at the Hudson Branch wetland while detected concentrations of vanadium provide a potential risk to foraging avian insectivores. These PCOPECs were retained as surface soil COPECs for the Hudson Branch wetland and are recommended for further evaluation.

A summary of risks to the various receptors within the habitats identified at or downgradient of the SMC Facility is presented in Table 7-1. Receptors not at risk are identified as well as the COPECs presenting a potential risk to those receptors where risk cannot be mled out. Based on the risk drivers identified in Table 7-1, several recommendations are provided as follows:

- Collect 8 to 10 background surface water and sediment samples from appropriate locations (Bumt Mill Branch) to provide sufficient samples for conducting a statistical comparison to detected surface water and sediment concentrations of PCOPECs within the Hudson Branch.

- Collect additional surface water samples within the Hudson Branch for total and dissolved concentrations of metals. Surface water sampling needs to be conducted in a manner that curtails the collection of turbid samples by minimizing the potential for disturbing the underlying sediment.

- Conduct sediment chemical and toxicity testing of sediments within the Hudson Branch containing elevated concentrations of COPECs. Chemical analyses should include metal concentrations while toxicity testing should include a sensitive invertebrate test species. The sediment samples should contain a range of PCOPEC concentrations in order to determine a sediment remediation goal that would be protective of the aquatic invertebrate community.

- Collect aquatic vegetation and aquatic invertebrate samples from the Hudson Branch to determine whether the COPECs providing a potential risk to avian and mammalian herbivores and insectivores ate bioaccumulating within these biota and to further evaluate whether the levels of COPECs in their tissues present a risk to wildlife receptors that forage on them. Background concentrations of aquatic vegetation and invertebrates should also be collected from reference areas associated with Bumt Mill Branch.

- Further evaluate the terrestrial/wetland plant communities present within the eastem storage areas, southem area and Hudson Branch wetland to determine whether elevated concentrations of COPECs are resulting in discemible impacts to the vegetation present in these areas.

- Collect terrestrial invertebrate samples (or conduct laboratory bioaccumulation studies) in order to determine tissue concentrations of chromium and vanadium at the eastem storage areas and Hudson Branch wetland. Potential effects to foraging avian and mammalian insectivores should be evaluated from the tissue concentrations of these COPECs. Background concentrations of terrestrial invertebrates should also be collected from appropriate reference areas.

COPECs identified in the SLERA are proposed to be further evaluated in a BERA. Additional sampling recommendations provided above will be incorporated into the BERA. A proposed Scope of Work for the BERA is provided in Appendix C.

8.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological Profile for Barium. U.S. Department of Health and Human Services. Publlc Health Service.

Baes, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor. 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Laboratory Publ. ORNL-5786.

Bechtel Jacobs. 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. BJC/OR-112. August.

Beyer, W.N. 1990. Evaluating soil contamination. U.S. Fish and Wildlife Service Biological Report 90:25.

Beyer, W.N., E.E. Gonnor, and S. Gerould. 1994. Estimates of soil ingestion by wildlife. J. Wildlife Management 58:375-382.

Blus, L.J. 1978. Short-tailed shrews: toxicity and residue relationships of DDT, dieldrin, and endrin. Arch. Environ. Contam. Toxicol. 7:83-98.

Borgmann, U., Y. Coulllard, P. Doyle, and D.G. Dixon. 2005. Toxicity of sixty-three metals and metalloids to Hyalella azteca at two levels of water hardness. Environ. Toxicol. Chem. 24(3):641-652.

Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34pp.

Bysshe, S.E. 1988. Uptake by biota. In: Bodek, I., W.J. Lyman, W.F. Reehl, and D.H. Rosenblatt (eds.). Environmental Inorganic Chemistry. Pergamon Press. New York.

Connell, D.W. and G.J. Miller. 1984. Chemistry and ecotoxicology of pollution. John Wiley and Sons. New York, New York. pp. 162-227.

EC, MENVIQ (Environment Canada and Misistere de l'Envionnement du Quebec). 1992. Interim Criteria for Quality Assessment of St. Lawrence River Sediment. Environment Canada, Ottawa.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concem for Effects on Terrestrial Plants: 1997 Revision. ES/ER/TM-85/R3. Oak Ridge National Laboratory.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. Toxicological Benchmarks for Gontaminants of Potential Concem for Effects on Soil and Litter Invertebrates and

Heterotrophic Process: 1997 Revision. ES/ER/TM-126/R2. Oak Ridge National Laboratory.

Eisler, R. 1985. Cadmium hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85:46.

Eisler, R. 1986a. Polychlorinated Biphenyl hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85:17. April.

Eisler, R. 1986b. Chromium hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85:60.

Eisler, R. 1987a. Mercury hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85:90.

Eisler, R. 1987b. Selenium hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85(1.5) 57pp.

Eisler, R. 1988. Lead hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85:134.

Eisler, R. 1993. Zinc hazards to fish, wildlife, and invertebrates: a synoptic review. *U.S. Fish and Wildlife Service Biological Report* 26:106.

Eisler, R. 2000. Handbook of chemical risk assessment: health hazards to humans, plants and animals, Volume I: Metals. Lewis Publishers, Boca Raton, FL.

ENSR. 1989. Remedial Investigation Work Plan, Shieldalloy Metallurgical Corporation, December.

Fuchsman, P.C. 2003. Modification of the equilibrium partitioning approach for volatile organic compounds in sediment. Environ. Toxicol. Chem. 22(7):1532-1534.

Gerhardt, A. 1995. Joint and single toxicity of Cd and Fe related to metal uptake in the Mayfly Leptophlebia marginata (L.)(Insecta). Hydrobiologia 306(3):229-240.

Gerhardt, A., and F. Westermamm. 1995. Effects of precipitations of iron hydroxides on Leptophlebia marginata (L.)(Insecta:Ephemeroptera) in the field. Arch. Hydrobiol. 133(1):81-93.

Hudson, R.H., Tucker, R.K., and M.A. Haegle. 1984. Handbook of toxicity of pesticides to wildlife. U.S. Department of the Interior. Fish and Wildlife Service. Washington, D.C. Resource Publication 153.

Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.J. Canfield, F.J. Dwyer, G.E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect

concentrations for the amphipod *Hyallela azteca* and the midge *Chironomus riparius*. International Assoc. Great Lakes Research. 22: 602-623.

Jager, T. 1998. Mechanistic approach for estimating bioconcentration of organic chemicals in earthworms (Oligochaeta). Environ. Toxicol. Chem. 17: 2080-2090.

Jones, D.S., G.W. Suter II, and R.N. Hull. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision. Lockheed Martin Energy Systems, Inc. ES/ER/TM-95/R4.

Klaassen, C.D. 1996. Casarett and Doull's Toxicology: The Basic Science of Poisons, fifth ed. McGraw-Hill, New York.

Locke, L.N. and N.J. Thomas. 1996. Lead poisoning of waterfowl and raptors. In: A. Fairbrother, L.N. Locke, and G.L. Hoff (eds.). *Noninfectious Diseases of Wildlife, Second Edition*.. Iowa State University Press. Ames, Iowa.

Long, E.R. and L.G. Morgan. 1991. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52, Seattle, WA.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quahty Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20 – 31.

Mayer, F.L. and M.R. Ellersieck. 1986. Manual of acute toxicity: Interpretation and data base for 410 chemicals and 66 species of freshwater animals. U.S. Department of the Interior. Fish and Wildlife Service. Washington, D.C. Resource Publlcation 160.

Nagy, K.A. 2001. Food requirements of wild animals: predictive equations for free-living mammals, reptiles, and birds. Nutrition Abstracts and Reviews. Series B: Livestock Feeds and Feeding, Vol. 71(10).

New Jersey Department of Environmental Protection (NJDEP). 2001. Basin Closure, NJDEP letter, August 10, 2001.

New Jersey Department of Environmental Protection (NJDEP). 2009. Ecological Screening Criteria. March 10.

New Jersey Department of Environmental Protection (NJDEP). 2010. Surface Water Quality Standards. January 4.

Persaud, D., R. Jaaguagi, and A. Hayton. 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Ontario Ministry of the Environment. March.

Reidel, G.F., and J.G. Sanders. 1996. The influence of pH and media composition on the uptake of inorganic selenium by Chlamydomonas reinhardtii. Environ. Toxicol. Chem. 15: 1577-1583.

Roberts, B.L. and H.W. Dorough. 1985. Hazards of chemicals to earthworms. *Environ. Toxicol. Chem.* 4:307-323.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge Nat. Lab. Publ. ES/ER/TM-86/R3.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge Nat. Lab. Publ. ES/ER/TM-220.

Sample, B.E. and G.W. Suter, II. 1994. Estimating Exposure of Terrestrial Wildlife to Contaminants. Environmental Sciences Division. Oak Ridge National Laboratory. ES/ER/TM-125. September.

Sax, N.I. and L.J. Lewis, Sr. 1989. Dangerous Properties of Industrial Materials, Seventh Edition. Vol. 1. New York, NY.

Scheuhammer, A.M. 1987. The chronic toxicity of aluminum, cadmium, mercury, and lead in birds: a review. Environ. Pollut. 46:263-295.

Schoor DePalma, 1994. Environmental Report, Wetlands and State Open Waters Delineation, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, Schoor DePalma, May 1994.

Smith, S.L., D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and J. Field. 1996. A Preliminary Evaluation of Sediment Quality Assessment Values for Freshwater Ecosystems. J. Great Lakes Res. 22: 624-638.

Stendell, R.C., W.N. Beyer, and R.A. Stehn. 1989. Accumulation of lead and organochiorine residues in captive American kestrels fed pine voles from apple orchards. J. Wildl. Dis. 25:388-391.

Suter, G.W. 1996. Toxicological benchmarks for screening contaminants of potential concem for effects on freshwater biota. Environ. Toxicol. Chem. 15:1232-1241.

Suter, G.W., II, and C.L. Tsao. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concem for Effects on Aquatic Biota: 1996 Revision. Oak Ridge Nat. Lab. Publ. ES/ER/TM-96/R2.

Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. 1995. The metal-metal interactions in biological systems: Part III: Daphnia magna. Water Air Soil Pollut. 82:695-711.

Travis, C.C., and A.D. Arms. 1988. Bioconcentration of Organics in Beef, Mlik and Vegetation. Environmental Science and Technology. Vol. 22: 271-274.

TRC, 1992. Remedial Investigation Technical Report, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, April 1992.

TRC, 1996a. Draft Final Feasibility Study Report, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, April 1996.

TRC, 1996b. Supplemental Wetland Sediment Sampling Letter Report, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Enviromnental Corporation, May 1996.

TRC, 2006. 2006 Sediment Sampling Work Plan, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, August 2006.

TRC, 2009. Supplemental Sediment Sanipling Summary, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, June 2009.

US Bankruptcy Court, 1997. Enyironmental Settiement Agreement (ESA) between SMC and USEPA/NJDEP. Incorporated into SMC's Plan of Reorganization Pursuant to Chapter 11 of the Bankruptcy Code, March 1997.

U.S. Environmental Protection Agency (USEPA). 1980. Ambient water quality criteria for DDT. Office of Water Regulations and Standards. Washington, D.C. EPA/440/5-80/038.

U.S. Environmental Protection Agency (USEPA). 1985. Chemical, physical, and biological properties of compounds present at hazardous waste sites - final report. Prepared by Clement Associates, Inc. for the U.S. Environmental Protection Agency. September.

U.S. Environmental Protection Agency (USEPA). 1993. Wildlife exposure factors handbook, Volume I of II. Office of Research and Development. EPA/600/R-93/187a. December.

U.S. Environmental Protection Agency (USEPA). 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA/540/R-97-006. June.

U.S. Environmental Protection Agency (USEPA). 1998. Guidelines for Ecological Risk Assessment. Risk Assessment Forum. Washington, D.C. EPA/630/R-95/002Fa. May.

U.S. Environmental Protection Agency (USEPA). 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Vol. 1. EPA530-D-99-001A. Office of Solid Waste and Emergency Response. August.

U.S. Environmental Protection Agency (USEPA). 2000. Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment. Available at: http://www.epa.gov/waterscience/cs/biotesting/bioaccum.pdf.

U.S. Environmental Protection Agency (USEPA). 2002. Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Birds and Mammals. November 21.

U.S. Environmental Protection Agency (USEPA). 2003a. Region 5 RCRA Ecological Screening Levels. August 22.

U.S. Environmental Protection Agency (USEPA). 2003b. Ecological Soil Screening Levels for Aluminum. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-60. November.

U.S. Environmental Protection Agency (USEPA). 2003c. Ecological Soil Screening Levels for Iron. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-69. November.

U.S. Environmental Protection Agency (USEPA). 2003d. Guidance for Developing Ecological Soil Screening Levels (eco-SSLs). Attachment 1-3. Evaluation of Dermal Contact and Inhalation Exposure Pathways for the Purpose of Setting Eco-SSLs. Office of Solid Waste and Emergency Response. OSWER Directive 92857-55. November.

U.S. Environmental Protection Agency (USEPA). 2005a. Ecological Soil Screening Levels for Antimony. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-61. February.

U.S. Environmental Protection Agency (USEPA). 2005b. Ecological Soil Screening Levels for Arsenic. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-62. March.

U.S. Environmental Protection Agency (USEPA). 2005c. Ecological Soil Screening Levels for Barium. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-63. February.

U.S. Environmental Protection Agency (USEPA). 2005d. Ecological Soil Screening Levels for Beryllium. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-64. February.

U.S. Environmental Protection Agency (USEPA). 2005e. Ecological Soil Screening Levels for Cadmium. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-65. March.

U.S. Environmental Protection Agency (USEPA). 2005f Ecological Soil Screening Levels for Cobalt. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-67. March.

U.S. Environmental Protection Agency (USEPA). 2005g. Ecological Soil Screening Levels for Lead. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-70. March.

U.S. Environmental Protection Agency (USEPA). 2005h. Ecological Soil Screening Levels for Vanadium. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-67. April.

U.S. Environmental Protection Agency (USEPA). 2006a. Region 3 BTAG Freshwater Screening Benchmarks. July.

U.S. Environmental Protection Agency (USEPA). 2006b. Ecological Soil Screening Levels for Silver. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-77. September.

U.S. Environmental Protection Agency (USEPA). 2007a. Ecological Soil Screening Levels for Copper. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-68. February.

U.S. Environmental Protection Agency (USEPA). 2007b. Ecological Soil Screening Levels for DDT and Metabolites. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-57. April.

U.S. Environmental Protection Agency (USEPA). 2007c. Ecological Soil Screening Levels for Manganese. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-71. April.

U.S. Environmental Protection Agency (USEPA). 2007d. Ecological Soil Screening Levels for Nickel. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-76. March.

U.S. Environmental Protection Agency (USEPA). 2007e. Ecological Soil Screening Levels for Selenium. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-72. July.

U.S. Environmental Protection Agency (USEPA). 2007f Ecological Soil Screening Levels for Zinc. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-73. June.

U.S. Environmental Protection Agency (USEPA). 2007g. Guidance for Developing Ecological Soil Screening Levels (eco-SSLs): Exposure Factors and Bioaccumulation Models for

Derivation of Wildlife eco-SSLs. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-55. April Revision.

U.S. Environmental Protection Agency (USEPA). 2007h. BSAF (Biota:Sediment Accumulation Factor) Data Set – Version 1.0. Office of Research and Development, National Health and Environmental Research Laboratory, Mid-Continent Ecology Division, Duluth, MN. Version 1.0 Available: http://www.epa.gov/med/prods_pubs.htm.

U.S. Environmental Protection Agency (USEPA). 2008. Ecological Soil Screening Levels for Chromium. Interim Final. Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-66. April.

U.S. Environmental Protection Agency (USEPA). 2009. National Recommended Water Quality Criteria. Office of Water/Office of Science and Technology.

Van Derveer, W. D., and Canton, S. P. 1997. Selenium sediment toxicity thresholds and derivation of water-quality criteria for freshwater biota of western streams. Environ. Toxicol. Chem. 16: 1260–1268.

Wentzel, R.S., T.W. LaPoint, M. Simini, R.T. Checkai, D. Ludwig, and L.W. Brewer. 1996. Tri-service procedural guidelines for ecological risk assessments. U.S. Dept. of the Navy, U.S. Dept. of the Air Force, and U.S. Dept. of the Army. June.

Wiemeyer, S.N., and R.D. Porter. 1970. DDE thins eggshells of captive American kestrels. Nature. 227:737-738.

Wolfe, M.F., S. Schwarzbach, and R.A. Sulaiman. 1998. Effects of mercury on wildlife a comprehensive review. Environ. Toxicol. Chem. 17:146-160.

TABLES

Table 2-1
Summary of Surface Water, Sediment and Surface Soil Samples
SMC Facility
Newfield, New Jersey

Sample Name	Sample Date	Sample Depth (in.)	Analyses	Notes
Surface Water				
SW-8	8/10/1995	-	TAL Metals, CN, Hardness	
SW-11	8/10/1995	-	TAL Metals, CN, Hardness	Field Duplicate Sample Collected
SW-21	8/10/1995	-	TAL Metals, CN	
SW-25	8/9/1995	-	TAL Metals, CN, Hardness	
SW27	8/9/1995	-	TAL Metals, CN, Hardness	
SW-30	8/9/1995	-	TAL Metals, CN, Hardness	Reference Area Sample
SW-35	8/9/1995	-	TAL Metals, CN, Hardness	Reference Area Sample
Sediment				
SD1-01	10/31/1990	0 - 6	TCL VOCs, TCL SVOCs, Pesticides, PCBs, TAL Metals, CN	
SD2-01	10/31/1990	0 - 6	TCL VOCs, TAL Metals, CN	
SD3-01	10/31/1990	0 - 6	TCL VOCs, TAL Metals, CN	Field Duplicate Sample Collected
SD4-01	10/31/1990	0 - 6	TCL VOCs, TCL SVOCs, Pesticides, PCBs, TAL Metals, CN	
SD-04-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD5-01	10/31/1990	0 - 6	TCL VOCs, TAL Metals, CN	
SD7-01	8/9/1995	0 - 6	TAL Metals, pH, TOC	
SD8-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD9-01	8/11/1995	0 - 6	TAL Metals, pH, TOC	
SD-9A	9/25/1995	0 - 6	TAL Metals, pH, TOC	
SD9A-01	8/11/1995	0 - 6	TAL Metals, pH, TOC	
SD-9A-0309-A	3/19/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD10-01	8/11/1995	0 - 6	TAL Metals, pH, TOC	Field Duplicate Sample Collected
SD-10	9/25/1995	0 - 6	TAL Metals, pH, TOC	
SD11-01	8/10/1995	0 - 6	Pesticides, PCBs, TAL Metals, pH, TOC	
SD11-02	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD12-01	8/11/1995	0 - 6	TAL Metals, pH, TOC	
SD-12-0309-A	3/19/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	Field Duplicate Sample Collected
SD13-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD14-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD-14	9/26/1995	0 - 6	TAL Metals, pH, TOC	
SD15-01	8/10/1995	0 - 6	Pesticides, PCBs, TAL Metals, pH, TOC	
SD-15-0309-A	3/19/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD16-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD17-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD-17	9/26/1995	0 - 6	TAL Metals, pH, TOC	
SD-17-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD18-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD-18-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD19-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD-19	9/26/1995	0 - 6	TAL Metals, pH, TOC	
SD-19-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD20-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD-20-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD21-01	8/10/1995	0 - 3	Pesticides, PCBs, TAL Metals, pH, TOC	
SD-21-02	8/10/1995	3 - 9	TAL Metals, pH, TOC	
SD22-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD23-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	
SD-23	9/26/1995	0 - 6	TAL Metals, pH, TOC	
SD-23-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD24-01	8/9/1995	0 - 6	Pesticides, PCBs, TAL Metals, pH, TOC	
SD25-01	8/9/1995	0 - 6	TAL Metals, pH, TOC	
SD-25-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	
SD26-01	8/9/1995	0 - 6	TAL Metals, pH, TOC	
SD27-01	8/9/1995	0 - 6	TAL Metals, pH, TOC	
SD-100A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-101A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-105B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-105C	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	
SD-106B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	
SD29-01	8/9/1995	0 - 6	TAL Metals, pH, TOC	Reference Area Sample
SD30-01	8/9/1995	0 - 6	TAL Metals, pH, TOC	Reference Area Sample
SD-30	9/25/1995	0 - 6	TAL Metals, pH, TOC	Reference Area Sample
SD-30-0309-A	3/18/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	Reference Area Sample
SD31-01	8/10/1995	0 - 6	TAL Metals, pH, TOC	Reference Area Sample
SD-35	9/26/1995	0 - 6	TAL Metals, pH, TOC	Reference Area Sample
SD-35-0309-A	3/19/2009	0 - 6	As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, pH, TOC	Reference Area Sample

Table 2-1
Summary of Surface Water, Sediment and Surface Soil Samples
SMC Facility
Newfield, New Jersey

Sample Name	Sample Date	Sample Depth (in.)	Analyses	Notes
Surface Soil				
Former Lagoon Area				
RA17-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA22-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB55-01	11/7/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB61-01	11/9/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB62-01	11/14/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB63-01	11/14/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB64-01	11/14/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB82-01	11/9/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB83-01	11/9/1990	0 - 24	TAL Metals, CN, Cr (VI)	
Eastern Storage Areas				
RA27-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA28-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA29-01	10/29/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA30-01	10/29/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA31-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA32-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA33-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI)	
RA34-01	10/30/1990	0 - 6	TCL VOCs, TCL SVOCs, Pesticides, PCBs, TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti, Zr	
RA41-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA42-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA49-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	Field Duplicate Sample Collected
RA50-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA51-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA52-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA56-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA57-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB20-01	11/6/1990	0 - 24	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB-20-1	8/9/1995	0 - 24	Pesticides, PCBs	
SB21-01	11/9/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB22-01	11/6/1990	0 - 24	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB-22-1	8/9/1995	0 - 24	Pesticides, PCBs	
SB23-01	11/12/1990	0 - 24	TAL Metals, CN, Cr (VI)	Field Duplicate Sample Collected
SB-23-1	8/9/1995	0 - 24	Be, Cr	
SB26-01	11/12/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB28-01	11/12/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB32-01	11/8/1990	0 - 24	PCBs, TAL Metals, CN, Cr (VI)	
SB33-01	11/8/1990	0 - 24	PCBs, TAL Metals, CN, Cr (VI)	
SS-13	8/7/1995	0 - 12	PCBs	
SS-14	8/7/1995	0 - 12	PCBs	
Southern Area				
RA01-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA02-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA07-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA08-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA09-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA10-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA18-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA19-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA20-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA21-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA23-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA24-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA26-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Sr, Ti	
RA35-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA38-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA39-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	Field Duplicate Sample Collected
RA45-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA47-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA53-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA54-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB07-01	11/6/1990	0 - 24	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB08-01	11/8/1990	0 - 24	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti, Zr	
SB09-01	11/9/1990	0 - 24	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB-9-1	8/9/1995	0 - 24	Cr (VI)	
SB10-01	11/8/1990	0 - 24	TAL Metals, CN, Cr (VI)	

Table 2-1
Summary of Surface Water, Sediment and Surface Soil Samples
SMC Facility
Newfield, New Jersey

Sample Name	Sample Date	Sample Depth (in.)	Analyses	Notes
SB11-01	11/14/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB13-01	11/6/1990	0 - 24	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SB15-01	11/8/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB17-01	11/8/1990	0 - 24	TAL Metals, CN, Cr (VI)	
SB18-01	11/8/1990	0 - 24	TAL Metals, CN, Cr (VI)	Field Duplicate Sample Collected
SS-22	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-25	8/10/1995	0 - 12	Be	
SS-26	8/10/1995	0 - 12	Be	
SS-27	8/10/1995	0 - 12	Be	
Hudson Branch Wetlands				
RA03-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA04-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA05-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA06-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA11-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA12-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA13-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA14-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA14-01	2/19/1991	0 - 6	Cr (VI)	
RA25-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA36-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA37-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA40-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA46-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
RA48-01	10/30/1990	0 - 6	TAL Metals, CN, Cr (VI), B, Nb, Sr, Ti	
SS-16	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-17	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-18	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-19	8/7/1995	0 - 12	TAL Metals, Cr (VI)	Field Duplicate Sample Collected
SS-20	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-21	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-23	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-24	8/7/1995	0 - 12	TAL Metals, Cr (VI)	
SS-28	8/10/1995	0 - 12	TAL Metals, Cr (VI), pH	
SD-100B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-100C	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-101B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-101C	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-102A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-102B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-103A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	
SD-103B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-103C	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-104A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-104B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-105A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd, CN	
SD-105D	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	
SD-106A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	
SD-107C	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	
SD-107A	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	
SD-107B	4/11/1996	0 - 6	Cr, Cu, Ni, Vd	

Notes:

TAL Metals = Target Analyte List Metals
TCL VOCs = Target Compound List Volatile Organic Compounds
TCL SVOCs = Target Compound List Semi-Volatile Organic Compounds
PCB = Polychlorinated Biphenyls
CN = Cyanide

As = Arsenic	Pb = Lead	B = Boron
Be = Beryllium	Mn = Manganese	Nb = Niobium
Cd = Cadmium	Hg = Mercury	Sr = Strontium
Cr = Chromium	Ni = Nickel	Ti = Titanium
Cu = Copper	Vd = Vanadium	Zt = Zirconium
Fe = Iron	Zn = Zinc	

Cr (VI) = Hexavalent Chromium
TOC = Total Organic Carbon (EPA Kahn Method)

Table 2-2
Selection of Preliminary Contaminants of Ecological Concern - Surface Water
SMC Facility
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Ref.	Maximum Detected Concentration	Detection Frequency	Retained as PCOPEC?	PCOPEC Selection Rationale
Inorganics, Total							
(ug/L)	Aluminum	87	b	2,310	100%	Yes	> Benchmark
	Arsenic	150	a	3.2	40%	No	< Benchmark
	Barium	220	a	119	100%	No	< Benchmark
	Beryllium	3.6	a	2.6	60%	No	< Benchmark
	Calcium	116,000	c	5,220	100%	No	< Benchmark
	Chromium	27	a	101	100%	Yes	> Benchmark
	Cobalt	24	a	10.1	40%	No	< Benchmark
	Copper	2.8	a	23.2	100%	Yes	> Benchmark
	Iron	1,000	b	3,080	100%	Yes	> Benchmark
	Lead	5.4	a	3.4	60%	No	> Benchmark
	Magnesium	82,000	c	8,670	100%	No	< Benchmark
	Manganese	120	c	194	100%	Yes	> Benchmark
	Nickel	15.7	a	19.2	80%	Yes	> Benchmark
	Potassium	53,000	c	21,850	100%	No	< Benchmark
	Selenium	5.0	a	4.4	40%	No	< Benchmark
	Sodium	680,000	c	205,500	100%	No	< Benchmark
	Vanadium	12	a	413	100%	Yes	> Benchmark
	Zinc	36	a	287	100%	Yes	> Benchmark

Notes:

ug/L - micrograms per liter or parts per billion (ppb)

PCOPEC - Preliminary contaminant of potential ecological concern

* Surface Water Screening Benchmarks from following sources:

(a) NJDEP Ecological Screening Criteria for Fresh Water (NJDEP, 2009)

(b) National Recommended Water Quality Criteria (USEPA, 2009)

(c) EPA Region III BTAG Freshwater Screening Benchmarks (USEPA, 2006)

Table 2-3
Selection of Preliminary Contaminants of Ecological Concern - Sediment
SMC Facility
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as PCOPEC?	PCOPEC Selection Rationale
VOCs							
(ug/kg)	1,2-Dichloroethene (Total)	654 (a)	5	40%	No	No	Max. Detect < Benchmark
	2-Butanone	270 (c)	130	100%	No	No	Max. Detect < Benchmark
	Acetone	8.7 (c)	430	100%	No	Yes	Max. Detect > Benchmark
	Carbon Disulfide	0.85 (b)	4	20%	No	Yes	Max. Detect > Benchmark
	Methylene Chloride	159 (a)	870	100%	No	Yes	Max. Detect > Benchmark
	Trichloroethene	112 (a)	7	20%	No	No	Max. Detect < Benchmark
SVOCs							
	Benzo(b)fluoranthene	10,400 (a)	110	50%	Yes	No	Max. Detect < Benchmark
	Benzoic acid	NA	3200	100%	No	Yes	No Benchmark Available
	bis(2-ethylhexyl)phthalate	182 (a)	580	100%	No	Yes	Max. Detect > Benchmark
	Butyl benzyl phthalate	1,970 (a)	140	50%	No	No	Max. Detect < Benchmark
	Chrysene	166 (a)	140	50%	Yes	No	Max. Detect < Benchmark
	Di-n-butyl phthalate	1,114 (a)	580	100%	No	No	Max. Detect < Benchmark
	Fluoranthene	423 (a)	210	100%	Yes	No	Max. Detect < Benchmark
	Pentachlorophenol	23,000 (a)	330	50%	Yes	No	Max. Detect < Benchmark
	Phenanthrene	204 (a)	110	50%	Yes	No	Max. Detect < Benchmark
	Phenol	49.1 (a)	520	100%	Yes	Yes	Max. Detect > Benchmark
	Pyrene	195 (a)	130	50%	Yes	No	Max. Detect < Benchmark
Pesticides							
(ug/kg)	4,4'-DDD	4.88 (a)	74	50%	Yes	Yes	Max. Detect > Benchmark
	4,4'-DDE	3.16 (a)	46	50%	Yes	Yes	Max. Detect > Benchmark
	4,4'-DDT	4.16 (a)	51	50%	Yes	Yes	Max. Detect > Benchmark
PCBs							
(ug/kg)	Aroclor 1248	30 (a)	1300	17%	Yes	Yes	Max. Detect > Benchmark
	Aroclor 1254	60 (a)	250	60%	Yes	Yes	Max. Detect > Benchmark
	Aroclor 1260	5 (a)	590	20%	Yes	Yes	Max. Detect > Benchmark
Inorganics							
(mg/kg)	Aluminum	25,500 (a)	32,700	100%	No	Yes	Max. Detect > Benchmark
	Antimony	2 (b)	270	80%	No	Yes	Max. Detect > Benchmark
	Arsenic	9.98 (a)	77.6	100%	Yes	Yes	Max. Detect > Benchmark

Table 2-3
Selection of Preliminary Contaminants of Ecological Concern - Sediment
SMC Facility
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as PCOPEC?	PCOPEC Selection Rationale
	Barium	NA	688	100%	No	Yes	No Benchmark Available
	Beryllium	NA	22.8	100%	No	Yes	No Benchmark Available
	Cadmium	0.99 (a)	3.9	27%	Yes	Yes	Max. Detect > Benchmark
	Calcium	NA	5,110	100%	No	No	Essential Nutrient
	Chromium	43.4 (a)	15,700	100%	No	Yes	Max. Detect > Benchmark
	Cobalt	50 (a)	67.3	100%	No	Yes	Max. Detect > Benchmark
	Copper	31.6 (a)	611	100%	Yes	Yes	Max. Detect > Benchmark
	Iron	20,000 (b)	43,500	100%	No	Yes	Max. Detect > Benchmark
	Lead	35.8 (a)	436.5	100%	Yes	Yes	Max. Detect > Benchmark
	Magnesium	NA	2,440	100%	No	No	Essential Nutrient
	Manganese	630 (a)	1,210	100%	No	Yes	Max. Detect > Benchmark
	Mercury	0.174 (a)	8.3	84%	Yes	Yes	Max. Detect > Benchmark
	Nickel	22.7 (a)	1,090	100%	Yes	Yes	Max. Detect > Benchmark
	Potassium	NA	1,960	80%	No	No	Essential Nutrient
	Selenium	2 (b)	7.2	71%	Yes	Yes	Max. Detect > Benchmark
	Silver	0.5 (a)	3.9	3%	Yes	No	Detected < 5% Frequency
	Sodium	NA	3,370	100%	No	No	Essential Nutrient
	Thallium	NA	1.1	3%	No	No	Detected < 5% Frequency
	Vanadium	NA	4,870	100%	No	Yes	No Benchmark Available
	Zinc	121 (a)	767	100%	Yes	Yes	Max. Detect > Benchmark

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppin).
ug/kg - micrograms per kilogram (dry weight) or parts per billion (ppb).
J - Estimated value.
PCOPEC - Preliminary contaminant of potential ecological concern
NA - No benchmark available for this compound.
PAHs - Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated Biphenyls.
SVOCs - Semivolatile Organic Compounds.

* Sediment Screening Benchmarks from following sources:
(a) - NJDEP Ecological Screening Criteria, March 2009.
(b) - Freshwater Sediment Screening Benchmarks, USEPA Region III, August 2006b.
(c) - Secondary Chronic Values via Equilibrium Partitioning (Jones et al., 1997).

[1] as listed by USEPA (2000)

Table 2-4
Selection of Preliminary Contaminants of Ecological Concern - Surface Soil
SMC Facility
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as PCOPEC?	PCOPEC Selection Rationale
Former Lagobn Area							
(mg/kg)	Aluminum	ph < 5.0	8610	100%	No	Yes	No Benchmark Available
	Antimony	0.27 (a)	6.5	11%	No	Yes	Max. Conc. > Benchmark
	Arsenic	18 (a)	2.1	89%	Yes	No	Max. Conc. < Benchmark
	Barium	330 (a)	36.2	100%	No	No	Max. Conc. < Benchmark
	Beryllium	21 (a)	3.5	100%	No	No	Max. Cone. < Benchmark
	Calcium	NA	1890	100%	No	No	Essential Nutrient
	Chromium	26 (a)	51.4	100%	No	Yes	Max. Conc. > Benchmark
	Chromium (VI)	130 (a)	0.3	33%	Yes	No	Max. Conc. < Benchmark
	Cobalt	13 (a)	8.2	78%	No	No	Max. Conc. < Benchmark
	Copper	28 (a)	91.3	100%	Yes	Yes	Max. Conc. > Benchmark
	Iron	ph < 5.0	23200	100%	No	Yes	No Benchmark Available
	Lead	11 (a)	14.7	100%	Yes	Yes	Max. Conc. > Benchmark
	Magnesium	NA	1460	100%	No	No	Essential Nutrient
	Manganese	220 (a)	408	100%	No	Yes	Max. Conc. > Benchmark
	Nickel	38 (a)	179	100%	Yes	Yes	Max. Conc. > Benchmark
	Potassium	NA	405	56%	No	No	Essential Nutrient
	Selenium	0.52 (a)	0.42	11%	Yes	No	Max. Conc. < Benchmark
	Sodium	NA	434	78%	No	No	Essential Nutrient
	Titanium	NA	128	100%	No	Yes	No Benchmark Available
	Vanadium	7.8 (a)	671	100%	No	Yes	Max. Conc. > Benchmark
	Zinc	46 (a)	48.9	100%	Yes	Yes	Max. Conc. > Benchmark
Eastern Storage Areas							
(ug/kg)	bis(2-ethylhexyl)phthalate	925 (b)	85	100%	No	No	Max. Conc. < Benchmark
	Di-n-butyl phthalate	200,000 (b)	210	100%	No	No	Max. Conc. < Benchmark
	Aroclor 1248	371 (b)	1900	13%	Yes	Yes	Max. Conc. > Benchmark
	Aroclor 1254	371 (b)	1500	50%	Yes	Yes	Max. Conc. > Benchmark
	Aroclor 1260	371 (b)	22	14%	Yes	No	Max. Conc. < Benchmark
(mg/kg)	Aluminuin	ph < 5.0	104000	100%	No	Yes	No Benchmark Available
	Antimony	0.27 (a)	13.8	13%	No	Yes	Max. Conc. > Benchmark
	Arsenic	18 (a)	4.7	96%	Yes	No	Max. Conc. < Benchmark

Table 2-4
Selection of Preliminary Contaminants of Ecological Concern - Surface Soil
SMC Facility
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as PCOPEC?	PCOPEC Selection Rationale
	Barium	330 (a)	683	96%	No	Yes	Max. Conc. > Benchmark
	Beryllium	ph < 5.0	35.5	92%	No	Yes	Max. Conc. > Benchmark
	Boron	0.5 (b)	208	29%	No	Yes	Max. Conc. > Benchmark
	Cadmium	0.36 (a)	2.8	13%	Yes	Yes	Max. Conc. > Benchmark
	Calcium	NA	115000	96%	No	No	Essential Nutrient
	Chromium	26 (a)	1100	100%	No	Yes	Max. Conc. > Benchmark
	Chromium (VI)	130 (a)	2.7	46%	Yes	No	Max. Conc. < Benchmark
	Cobalt	13 (a)	19	79%	Nd	Yes	Max. Conc. > Benchmark
	Copper	28 (a)	342	100%	Yes	Yes	Max. Conc. > Benchmark
	Cyanide	1.33 (b)	0.58	9%	No	No	Max. Conc. < Benchmark
	Iron	ph < 5.0	27100	100%	No	Yes	No Benchmark Available
	Lead	11 (a)	331	100%	Yes	Yes	Max. Conc. > Benchmark
	Magnesium	NA	50500	96%	No	No	Essential Nutrient
	Manganese	220 (a)	3150	100%	No	Yes	Max. Conc. > Benchmark
	Mercury	0.1 (b)	0.09	4%	Yes	No	Detected < 5% Frequency
	Nickel	38 (a)	1110	96%	Yes	Yes	Max. Conc. > Benchmark
	Niobium	NA	69.7	18%	No	Yes	No Benchmark Available
	Potassium	NA	1110	58%	No	No	Essential Nutrient
	Selenium	0.52 (a)	0.42	8%	Yes	No	Max. Conc. < Benchmark
	Silver	4.2 (a)	2.3	4%	Yes	No	Detected < 5% Frequency
	Sodium	NA	1520	96%	No	No	Essential Nutrient
	Strontium	NA	171	24%	No	Yes	No Benchmark Available
	Titanium	NA	941	100%	No	Yes	No Benchmark Available
	Vanadium	7.8 (a)	4875	100%	No	Yes	Max. Conc. > Benchmark
	Zinc	46 (a)	335	100%	Yes	Yes	Max. Conc. > Benchmark
	Zirconium	NA	101	100%	No	Yes	No Benchmark Available
Southern Area							
(mg/kg)	Aluminum	ph < 5.0	9000	100%	No	Yes	No Benchmark Available
	Antimony	0.27 (a)	7.3	13%	No	Yes	Max. Conc. > Benchmark
	Arsenic	18 (a)	6.1	97%	Yes	No	Max. Conc. < Benchmark
	Barium	330 (a)	110	100%	No	No	Max. Conc. < Benchmark

Table 2-4
Selection of Preliminary Contaminants of Ecological Concern - Surface Soil
SMC Facility
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as PCOPEC?	PCOPEC Selection Rationale
	Beryllium	21 (a)	8.9	76%	No	No	Max. Conc. < Benchmark
	Boron	0.5 (b)	20.7	4%	No	No	Detected < 5% Frequency
	Calcium	NA	8650	100%	No	No	Essential Nutrient
	Chromium	26 (a)	102	100%	No	Yes	Max. Conc. > Benchmark
	Chromium (VI)	130 (a)	2.3	19%	Yes	No	Max. Conc. < Benchmark
	Cobalt	13 (a)	4.7	40%	No	No	Max. Conc. < Benchmark
	Copper	28 (a)	17.2	97%	Yes	No	Max. Conc. < Benchmark
	Iron	ph < 5.0	13900	100%	No	Yes	No Benchmark Available
	Lead	11 (a)	98.9	100%	Yes	Yes	Max. Conc. > Benchmark
	Magnesium	NA	14900	100%	No	No	Essential Nutrient
	Manganese	220 (a)	547	100%	No	Yes	Max. Conc. > Benchmark
	Mercury	0.1 (b)	0.52	33%	Yes	Yes	Max. Conc. > Benchmark
	Nickel	38 (a)	189	70%	Yes	Yes	Max. Conc. > Benchmark
	Potassium	NA	781	53%	No	No	Essential Nutrient
	Selenium	0.52 (a)	0.55	13%	Yes	Yes	Max. Conc. > Benchmark
	Silver	4.2 (a)	2.2	23%	Yes	No	Max. Conc. < Benchmark
	Sodium	NA	371.5	97%	No	No	Essential Nutrient
	Strontium	NA	22.5	8%	No	Yes	No Benchmark Available
	Titanium	NA	200	100%	No	Yes	No Benchmark Available
	Vanadium	7.8 (a)	1810	100%	No	Yes	Max. Conc. > Benchmark
	Zinc	46 (a)	476	100%	Yes	Yes	Max. Conc. > Benchmark
Hudson Branch Wetlands							
(mg/kg)	Aluminum	ph < 5.0	37400	100%	No	Yes	No Benchmark Available
	Antimony	0.27 (a)	7	13%	No	Yes	Max. Conc. > Benchmark
	Arsenic	18 (a)	6.2	96%	Yes	No	Max. Conc. < Benchmark
	Barium	330 (a)	739	100%	No	Yes	Max. Conc. > Benchmark
	Beryllium	21 (a)	60.1	83%	No	Yes	Max. Conc. > Benchmark
	Cadmium	0.36 (a)	5.3	13%	Yes	Yes	Max. Conc. > Benchmark
	Calcium	NA	7320	100%	No	No	Essential Nutrient
	Chromium	26 (a)	8940	100%	No	Yes	Max. Conc. > Benchmark
	Chromium (VI)	130 (a)	5.3	17%	Yes	No	Max. Conc. < Benchmark

Table 2-4
Selection of Preliminary Contaminants of Ecological Concern - Surface Soil
SMC Facility
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as PCOPEC?	PCOPEC Selection Rationale
	Cobalt	13 (a)	87.1	43%	No	Yes	Max. Conc. > Benchmark
	Copper	28 (a)	887	100%	Yes	Yes	Max. Conc. > Benchmark
	Iron	ph < 5.0	32300	100%	No	Yes	No Benchmark Available
	Lead	11 (a)	760	100%	Yes	Yes	Max. Conc. > Benchmark
	Magnesium	NA	4380	100%	No	No	Essential Nutrient
	Manganese	220 (a)	1680	100%	No	Yes	Max. Conc. > Benchmark
	Mercury	0.1 (b)	0.52	74%	Yes	Yes	Max. Conc. > Benchmark
	Nickel	38 (a)	3360	91%	Yes	Yes	Max. Conc. > Benchmark
	Potassium	NA	1040	52%	No	No	Essential Nutrient
	Selenium	0.52 (a)	0.62	48%	Yes	Yes	Max. Conc. > Benchmark
	Silver	4.2 (a)	1.5	9%	Yes	No	Max. Conc. < Benchmark
	Sodium	NA	598	100%	No	No	Essential Nutrient
	Thallium	1 (b)	0.37	4%	No	No	Detected < 5% Frequency
	Titanium	NA	1480	100%	No	Yes	No Benchmark Available
	Vanadium	7.8 (a)	12100	100%	No	Yes	Max. Conc. > Benchmark
	Zinc	46 (a)	1310	100%	Yes	Yes	Max. Conc. > Benchmark

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

ug/kg - micrograms per kilogram (dry weight) or parts per billion (ppb).

PCOPEC - Preliminary contaminant of potential ecological concern

NA - No benchmark available for this compound.

* Surface Soil Screening Benchmarks from following sources:

(a) - USEPA eco-SSL (USEPA, 2003; 2005; 2006; 2007; 2008; 2009).

(b) - NJDEP Ecological Screening Criteria, March 2009.

[1] as listed by USEPA (2000)

Table 2-5
Assessment Endpoints and Measurement Endpoints
SMC Facility
Newfield, New Jersey

Assessment Endpoints	Measurement Endpoints	Exposure Area
Aquatic Invertebrate Community Diversity and Abundance	Comparison of surface water PCOPEC concentrations with surface water thresholds associated with adverse effects to invertebrates. Comparison of bulk sediment PCOPEC concentrations with sediment thresholds and probable adverse effects to benthic biota.	Hudson Branch
Mammalian Semi-Aquatic Herbivore Survival/Reproduction/Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by muskrat to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Hudson Branch
Avian Semi-Aquatic Herbivore Survival/Reproduction/Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by mallard to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Hudson Branch
Avian Semi-Aquatic Insectivore Survival/Reproduction/Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by tree swallow to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Hudson Branch
Mammalian Semi-Aquatic Insectivore Survival/Reproduction/Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by little brown bat to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Hudson Branch
Terrestrial Plant Community Survival/ Growth	Comparison of bulk surface soil PCOPEC concentrations with soil levels associated with potential adverse effects to vegetation.	Former Lagoon Area, Eastern Storage Areas, Southern Area, Hudson Branch Wetlands
Avian Terrestrial Herbivore Survival/Reproduction/Grpwth	Comparison of estimated bioaccumulative PCOPEC exposure doses received by mourning dove to chronic NOAEL survival, reproductive, or growth effects reported in scientific literature.	Former Lagoon Area, Eastern Storage Areas, Southern Area, Hudson Branch Wetlands
Mammalian Terrestrial Herbivore Survival/Reproduction/Growth	Comparison of estimated bioaccumulative PCOPEC exposure doses received by white-footed mouse to chronic NOAEL survival, reproductive, or growth effects reported in scientific literature.	Former Lagoon Area, Eastern Storage Areas, Southern Area, Hudson Branch Wetlands

Table 2-5
Assessment Endpoints and Measurement Endpoints
SMC Facility
Newfield, New Jersey

Assessment Endpoints	Measurement Endpoints	Exposure Area
Avian Terrestrial Insectivore Survival/Reproduction/Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by American robin to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Former Lagoon Area, Eastern Storage Areas, Southern Area, Hudson Branch Wetlands
Mammalian Terrestrial Insectivore Survival/Reproduction/ Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by short-tailed shrew to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Former Lagoon Area, Eastern Storage Areas, Southern Area, Hudson Branch Wetlands
Avian Terrestrial Carnivore Survival/Reproduction/Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by red-tailed hawk to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Former Lagoon Area, Eastern Storage Areas, Southern Area, Hudson Branch Wetlands
Mammalian Terrestrial Carnivore Survival/Reproduction/ Growth	Comparison of estimated bioaccumulative PCOPEC exposure dose received by red fox to chronic NOAEL survival, reproductive, or growth effect concentrations reported in literature.	Former Lagoon Area, Eastern Storage Areas, Southern Area, Hudson Branch Wetlands

Table 3-1
Aquatic Invertebrate Toxicity Reference Values - Surface Water
SMC Facility
Newfield, New Jersey

Surface Water PCOPEC	Concentration (ug/L)	Species	Endpoint	Reference
Aluminum	87	All aquatic organisms	Chronic (CCC) Water Quality Criterion	USEPA, 2009
	89	Hyalella azteca	LC50	Borgmann et aL, 2005
	540	Daphnids	Lowest Test EC20	Suter, 1996
	750	All aquatic organisms	Acute (CMC) Water Quality Criterion	USEPA, 2009
	1,900	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
Chromium	27.0	All aquatic organisms	Chronic (CCC) Water Quality Criterion	NJDEP, 2010
	< 44.0	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	565	All aquatic organisms	Acute (CMC) Water Quality Criterion	NJDEP, 2010
	> 1,000	Hyalella azteca	LC50	Borgmann et al., 2005
Copper	0.21	Daphnids	Lowest Test EC20	Suter, 1996
	0.23	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	2.78	All aquatic organisms	Chronic (CCC) Water Quality Criterion	NJDEP, 2010
	3.68	All aquatic organisms	Acute (CMC) Water Quality Criterion	NJDEP, 2010
	6.07	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	Suter, 1996
	36.0	Hyalella azteca	LC50	Borgmann et al., 2005
Iron	16.0	Daphnids	Lowest Test EC20	Suter, 1996
	158	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	1,000	All aquatic organisms	Chronic (CCC) Water Quality Criterion	USEPA, 2009
	1,640	Leptophlebia marginata	NOAEL - Survival (84 days exposure)	Gerhardt and Westermann, 1995
	> 1,000	Hyalella azteca	LC50	Borgmann et al., 2005
	73,070	Leptophlebia marginata	LC50	Gerhardt, 1995
Manganese	80.3	All aquatic organisms	Tier II - Secondary Chronic Value	Suter, 1996
	> 1,000	Hyalella azteca	LC50	Borgmann et al., 2005
	< 1,100	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	< 1,100	Daphnids	Lowest Test EC20	Suter, 1996
	1,470	All aquatic organisms	Tier II - Secondary Acute Value	Suter, 1996
Nickel	< 5	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	15.7	All aquatic organisms	Chronic (CCC) Water Quality Criterion	NJDEP, 2010
	45.0	Daphnids	Lowest Test EC20	Suter, 1996
	75.0	Hyalella azteca	LC50	Borgmann et aL, 2005
	128	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	Suter, 1996
	142	All aquatic organisms	Acute (CMC) Water Quality Criterion	NJDEP, 2010
Vanadium	19.1	All aquatic organisms	Tier II - Secondary Chronic Value	Suter, 1996
	284	All aquatic organisms	Tier II - Secondary Acute Value	Suter, 1996
	430	Daphnids	Lowest Test EC20	Suter, 1996
	> 980	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	1,251	Hyalella azteca	LC50	Borgmann et al., 2005
	4,500	Daphnia magna	LC50	Tomasik, et al., 1995
Zinc	36.1	All aquatic organisms	Chronic (CCC) Water Quality Criterion	NJDEP, 2010
	36.1	All aquatic organisms	Acute (CMC) Water Quality Criterion	NJDEP, 2010
	46.7	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	56.0	Hyalella azteca	LC50	Borgmann et al., 2005
	> 5,243	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	Suter, 1996

Table 3-2
Aquatic Invertebrate Toxicity Reference Values - Sediment
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Concentration (mg/kg)	Species	Endpoint	Reference
VOCs				
Acetone	22.5*	Aquatic benthic organisms	Equilibrium Partitioning Benchmark	Fuchsman, 2003
Carbon Disulfide	2.20*	Aquatic benthic organisms	Equilibrium Partitioning Benchmark	Fuchsman, 2003
Methylene Chloride	26.0*	Aquatic benthic organisms	Equilibrium Partitioning Benchmark	Fuchsman, 2003
SVOCs				
Benzoic Acid	NA	-	-	-
Bis(2-ethylhexyl)phthalate	8,900*	Aquatic benthic organisms	Tier II - Secondary Chronic Value - Equil. Partition.	Jones et al., 1997
Phenol	1.40*	Aquatic benthic organisms	Equilibrium Partitioning Benchmark	Fuchsman, 2003
Pesticides				
4,4'-DDD	0.0049	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	0.60*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
4,4'-DDE	0.0032	Aquatic benthic organisnis	Threshold Effect Concentration	MacDonald et al., 2000
	1.90*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
4,4'-DDT	0.0042	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	7.10*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
PCBs				
Aroclor 1248	-	-	-	-
Aroclor 1254	-	-	-	-
Aroclor 1260	-	-	-	-
Total PCBs	0.059	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	53.0*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
Inorganics				
Aluminum	25,500	Hyalella azteca	Threshold Effect Concentration	Ingersoll et al., 1996
Antimony	3	Aquatic benthic organisms	Upper Effects Threshold	Buchman, 2008
Arsenic	9.79	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	33	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Barium	NA	-	-	-
Beryllium	NA	-	-	-
Cadmium	0.99	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	4.98	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Chromium	43.4	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	111	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Cobalt	50	Aquatic benthic organisms	Open Water Disposal Guideline	Persaud et al., 1993
Copper	31.6	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	149	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Iron	20,000	Aquatic benthic organisms	Lowest Effect Level	Persaud et al., 1993
	40,000	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
Lead	35.8	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	128	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Manganese	630	Hyalella azteca	Threshold Effect Concentration	Ingersoll et al., 1996
	1,100	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
Mercury	0.18	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.06	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Nickel	22.7	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	48.6	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Selenium	NA	-	-	-
Vanadium	NA	-	-	-
Zinc	121	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	459	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

PCOPEC - Preliminary contaminant of potential ecological concern

NA - No benchmark available for this compound.

VOCs - Volatile Organic Compounds

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls

* Adjusted to mean organic carbon content of Hudson Branch sediment (10.0%)

Table 3-3
Terrestrial Plant Toxicity Reference Values - Surface Soil
SMC Facility
Newfield, New Jersey

Surface Soil PCOPEC	Concentration (mg/kg)	Endpoint	Reference
PCBs			
Aroclor 1248	40.0	Phytotoxicity Screening Benchmark	Efroymson et al., 1997a
Amclor 1254	40.0	Phytotoxicity Screening Benchmark	Efroymson et al., 1997a
Inorganics			
Aluminum	Non-Toxic	Not correlated with plant toxicity	USEPA, 2003b
Antimony	5.0	Phytotoxicity Screening Benchmark	Efroymson et al., 1997a
Barium	1,414	MATC - Phytotoxicity Study	USEPA, 2005c
Beryllium	56.8	MATC - Phytotoxicity Study	USEPA, 2005d
Boron	0.50	Phytotoxicity Screening Benchmark	Efroymson et al., 1997a
Cadmium	32.0	Plant Soil Screening Level	USEPA, 2005e
Chromium	NA	-	-
Cobalt	13.0	Plant Soil Screening Level	USEPA, 2005f
Copper	70.0	Plant Soil Screening Level	USEPA, 2007a
Iron	NA	-	-
Lead	120	Plant Soil Screening Level	USEPA, 2005g
Manganese	220	Plant Soil Screening Level	USEPA, 2007c
Mercury	0.30	Phytotoxicity Screening Benchmark	Efroymson et al., 1997a
Nickel	38.0	Plant Soil Screening Level	USEPA, 2007c
Niobium	NA	-	-
Selenium	0.52	Plant Soil Screening Level	USEPA, 2007e
Strontium	NA	-	-
Titanium	NA	-	-
Vanadium	100	MATC - Phytotoxicity Study	USEPA, 2005h
Zinc	160	Plant Soil Screening Level	USEPA, 2007f
Zirconium	NA	-	-

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
PCOPEC - Preliminary contaminant of potential ecological concern
NA - No benchmark available for this compound.
PCBs - Polychlorinated Biphenyls
MATC - Maximum acceptable toxicant concentration

Table 3-4
Avian Chronic NOAEL Toxicity Reference Values
SMC Facility
Newfield, New Jersey

PCOPEC	Test Species	Body Weight (kg)	Exposure Route and Duration Class	Duration	System	Test TRV (mg/kg-BW/day)	Test TRV Type	NOAEL	Reference	Avian TRV (mg/kg-BW/day)
SVOCs										
Phenol	NA	-	-	-	-	-	-	-	-	-
Pesticides/PCBs										
4,4-DDD	see total DDT	-	-	-	-	-	-	-	-	-
4,4-DDE	see total DDT	-	-	-	-	-	-	-	-	-
4,4'-DDT	see total DDT	-	-	-	-	-	-	-	-	-
Total DDT	chicken	2.037	oral in diet (chronic)	30 days	growth	0.227	NOAEL	0.227	USEPA, 2007b	0.23
Aroclor 1248	see ring-necked pheasant study for Aroclor 1254					1.8	LOAEL	0.36	Sample et al., 1996	0.36
Aroclor 1254	ring-necked pheasant	1.0	oral in diet (chronic)	17 weeks	reproductive	1.8	LOAEL	0.36	Sample et al., 1996	0.36
Aroclor 1260	see ritig-necked pheasant study for Aroclor 1254					1.8	LOAEL	0.36	Sample et al., 1996	0.36
Inorganics										
Antimony	NA	-	-	-	-	-	-	-	-	-
Arsenic	chicken	1.60	oral in diet (chronic)	19 days	reproductive	2.24	NOAEL	2.24	USEPA, 2005b	2.24
Barium	chicken	0.12	oral in diet (subchronic)	4 weeks	mortality	20.8	NOAEL	20.8	Sample et al., 1996	20.8
Beryllium	NA	-	-	-	-	-	-	-	-	-
Cadmium	mean of test species	-	-	-	growth/reprod.	1.47	NOAEL	1.47	USEPA, 2005e	1.47
Chromium	mean of test species	-	-	-	growth/reprod.	2.66	NOAEL	2.66	USEPA, 2008	2.66
Cobalt	mean of test species	-	-	-	growth/reprod.	7.61	NOAEL	7.61	USEPA, 2005f	7.61
Copper	chicken	1.52	oral in diet (chronic)	84 days	reproductive	4.05	NOAEL	4.05	USEPA, 2007a	4.05
Lead	chicken	1.81	oral in diet (chronic)	4 weeks	reproductive	1.63	NOAEL	1.63	USEPA, 2005g	1.63
Manganese	mean of test species	-	-	-	growth/reprod.	179	NOAEL	179	USEPA, 2007c	179
Mercury	mallard	-	oral in diet (chronic)	3 generations	reproductive	0.039	NOAEL	0.039	USEPA, 2002	0.039
Nickel	mean of test species	-	-	-	growth/reprod.	6.71	NOAEL	6.71	USEPA, 2007d	6.71
Selenium	chicken	0.328	oral in diet (chronic)	2 weeks	mortality	0.29	NOAEL	0.29	USEPA, 2007e	0.29
Vanadium	chicken	1.042	oral in diet (chronic)	5 weeks	growth	0.34	NOAEL	0.34	USEPA, 2005h	0.34
Zinc	mean of test species	-	-	-	growth/reprod.	66.1	NOAEL	66.1	USEPA, 2007f	66.1

Notes:

PCOPEC - preliminary contaminant of potential ecological concern

TRV - toxicity reference value

NOAEL - no observable adverse effect level

LOAEL - lowest observable adverse effect level

NA = Toxicity reference value not available

Table 3-5
Mammalian Chronic NOAEL Toxicity Reference Values
SMC Facility
Newfield, New Jersey

PCOPECs	Test Species	Body Weight (kg)	Exposure Route and Duration Class	Duration	System	Test TRV (mg/kg-BW/day)	Test TRV Type	NOAEL	Reference	Mammal TRV (mg/kg-BW/day)
SVOCs										
Phenol	rat	-	oral gavage (subchronic)	9 days	reproductive	120	NOAEL	120	IRIS Database, 2011	120
Pesticides/PCBs										
4,4-DDD	see total DDT	-	-	-	-	-	-	-	-	-
4,4-DDE	see total DDT	-	-	-	-	-	-	-	-	-
4,4'-DDT	see total DDT	-	-	-	-	-	-	-	-	-
Total DDT	rat	0.0683	oral gavage (chronic)	15 days	reproductive	0.147	NOAEL	0.147	USEPA, 2007b	0.15
PCB Aroclor 1248	rhesus monkey	5.0	oral in diet (chronic)	14 months	reproductive	2.50	LOAEL	0.50	Sample et al., 1996	0.50
PCB Aroclor 1254	oldfield mouse	0.014	oral in diet (chronic)	12 months	reproductive	0.68	LOAEL	0.136	Sample et al., 1996	0.14
PCB Arcolor 1260	see oldfield mouse study for PCB Aroclor 1254					0.68	LOAEL	0.136	Sample et al., 1996	0.14
Inorganics										
Antimony	rat	0.33	oral - water (chronic)	31 days	reproductive	0.059	NOAEL	0.059	USEPA, 2005a	0.059
Arsenic	dog	10.1	oral in diet (chronic)	8 weeks	growth	1.04	NOAEL	1.04	USEPA, 2005b	1.04
Barium	mean of test species	-	-	-	growth/reprod.	51.8	NOAEL	51.8	USEPA, 2005c	51.8
Beryllium	rat	0.49	oral - water (chronic)	4 years	mortality	0.532	NOAEL	0.532	USEPA, 2005d	0.53
Cadmium	rat	0.43	oral - water (chronic)	2 weeks	growth	0.77	NOAEL	0.77	USEPA, 2005e	0.77
Chromium	pig	42.6	oral in diet (chronic)	35 days	growth	2.40	NOAEL	2.40	USEPA, 2008	2.40
Cobalt	mean of test species	-	-	-	growth/reprod.	7.33	NOAEL	7.33	USEPA, 2005f	7.33
Copper	pig	100	oral in diet (chronic)	4 weeks	growth/mortality	5.60	NOAEL	5.60	USEPA, 2007a	5.60
Lead	rat	0.30	oral - water (chronic)	7 weeks	growth	4.70	NOAEL	4.70	USEPA, 2005g	4.70
Manganese	sheep	38.4	oral in diet (chronic)	84 days	growth	59.4	NOAEL	59.4	USEPA, 2007b	59.4
Mercury	rat	0.22	oral in diet (chronic)	122 days	reproductive	0.25	NOAEL	0.25	USEPA, 2002	0.25
Nickel	mouse	0.025	other oral (chronic)	35 days	reproductive	1.70	NOAEL	1.70	USEPA, 2007d	1.70
Selenium	pig	17.8	oral in diet (chronic)	37 days	growth	0.143	NOAEL	0.143	USEPA, 2007e	0.14
Vanadium	mouse	0.0471	oral gavage (chronic)	12 days	reprod./mortality	4.16	NOAEL	4.16	USEPA, 2005h	4.16
Zinc	rabbit	3.21	oral gavage (chronic)	13 days	reprod./mortality	60.0	NOAEL	60.0	USEPA, 2007f	60.0

Notes:

PCOPEC - preliminary contaminant of potential ecological concern

TRV - toxicity reference value

NOAEL - no observable adverse effect level

LOAEL - lowest observable adverse effect level

NA - toxicity reference value not available

Table 4-1
Exposure Factors for Selected Indicator Receptor Species
SMC Facility
Newfield, New Jersey

CHARACTER	VALUE	SOURCE	COMMENT
BODY WEIGHT			
Muskrat	1.35 kg	Dozier (1950) cited in USEPA (1993)	Adult breeding female in New York in winter
Mallard	1.04 kg	Nelson and Martin (1953) cited in USEPA (1993)	Mean of adult females throughout North America
Little Brown Bat	0.0075 kg	Gould (1955) cited in Sample and Suter (1994)	-
Tree Swallow	0.021 kg	Dunning (1993) cited in Sample et al. (1997)	Mean of adults in Pennsylvania
Mourning Dove	0.120 kg	Hanson and Kossack (1957) cited in USEPA (2007)	-
American Robin	0.077 kg	Dunning (1984) cited in USEPA (1993)	-
White-footed Mouse	0.022 kg	Green and Millar (1987) cited in Sample and Suter (1994)	-
Short-tailed Shrew	0.015	Schlessinger and Potter (1974) cited in USEPA (1993)	Breeding adults
Red-tailed Hawk	1.028	Craighead and Craighead (1956) cited in USEPA (1993)	Mean of adult males in Michigan and Pennsylvania (lighter than females)
Red Fox	4.04 kg	Storm et al. (1976) cited in USEPA (1993)	Mean female weight in Illinois and Iowa during spring and fall, respectively
FOOD INGESTION RATE			
Muskrat	0.0794 kg/day (dry weight)	Nagy (2001)	Value for herbivorous mammals
Mallard	0.0744 kg/day (dry weight)	Nagy (2001)	Value for all birds
Little Brown Bat	0.0016 kg/day (dry weight)	Nagy (2001)	Value for little brown bat
Tree Swallow	0.0116 kg/day (dry weight)	Nagy (2001)	Value for tree swallow
Mourning Dove	0.0166 kg/day (dry weight)	Nagy (2001)	Value for passerine birds
American Robin	0.0094 kg/day (dryweight)	Nagy (2001)	Value for temperate forest birds
White-footed Mouse	0.0030 kg/day (dry weight)	Nagy (2001)	Value for white-footed mouse
Short-tailed Shrew	0.0020 kg/day (dry weight)	Nagy (2001)	Value for insectivorous mammals
Red-tailed Hawk	0.0843 kg/day (dry weight)	Nagy (2001)	Value for carnivorous birds
Red Fox	0.1558 kg/day (dry weight)	Nagy (2001)	Value for carnivorous mammals
SURFACE WATER INGESTION RATE			
Muskrat	0.130 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Mallard	0.058 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Little Brown Bat	0.001 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Tree Swallow	0.004 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Mourning Dove	0.119 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above

Table 4-1
Exposure Factors for Selected Indicator Receptor Species
SMC Facility
Newfield, New Jersey

CHARACTER	VALUE	SOURCE	COMMENT
American Robin	0.011 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
White-footed Mouse	0.007 L/day	Oswald et al. (1993) cited in Sample and Suter (1994)	Non-breeding female in captivity
Short-tailed Shrew	0.003 L/day	Chew (1951) cited in Sample and Suter (1994)	-
Red-tailed Hawk	0.060 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Red Fox	0.348 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
SEDIMENT/SOIL INGESTION			
Muskrat	0.0019 kg/day (dry weight)	Beyer et al. (in press) cited in USEPA (1993)	Based on 2.4% of diet (dry weight) for meadow vole
Mallard	0.0015 kg/day (dry weight)	Beyer et al. (in press) cited in USEPA (1993)	Based on 2% of diet (dry weight) for mallard
Little Brown Bat	0.00 kg/day	Sample and Suter (1994)	Aerial insectivore - negligible
Tree Swallow	0.00 kg/day	Sample et al., (1997)	Aerial insectivore - negligible
Mourning Dove	0.0015 kg/day (dry weight)	Beyer et al. (1994)	Based on 9.3% of diet (dry weight basis) for wild turkey
American Robin	0.0002 kg/day (dry weight)	Sample and Suter (1994)	Based on 2.1% of diet
White-footed Mouse	0.00006 kg/day (dry weight)	Sample and Suter (1994)	Based on <2% of diet
Short-tailed Shrew	0.0003 kg/day (dry weight)	Sample and Suter (1994)	Based on 13% of diet (dry weight basis)
Red-tailed Hawk	0.00 kg/day	Sample and Suter (1994)	Raptor - assumed to be negligible
Red Fox	0.0044 kg/day (dry weight)	Beyer et al. (1994)	Based on 2.8% of diet (dry weight basis)
DIET COMPOSITION			
Muskrat	100% Vegetation	USEPA (1993)	Conservative for this exposure pathway
Mallard	100% Vegetation	USEPA (1993)	Conservative for this exposure pathway
Little Brown Bat	100% Aquatic Invertebrates	USEPA (1997)	Conservative for this exposure pathway
Tree Swallow	100% Aquatic Invertebrates	Sample et al., (1997)	Conservative for this exposure pathway
Mourning Dove	100% Vegetation	USEPA (1997)	Conservative for this exposure pathway
American Robin	100% Terrestrial Invertebrates	USEPA (1997)	Conservative for this exposure pathway
White-footed Mouse	100% Vegetation	USEPA (1997)	Conservative for this exposure pathway
Short-tailed Shrew	100% Terrestrial Invertebrates	USEPA (1997)	Conservative for this exposure pathway
Red-tailed Hawk	100% Small Mammals	USEPA (1997)	Conservative for this exposure pathway
Red Fox	100% Small Mammals	USEPA (1997)	Conservative for this exposure pathway
AREA USE FACTOR			
All Species	1	USEPA (1997)	Conservatively assumed home range entirely within area of contamination
TEMPORAL USE FACTOR			
All Species	1	USEPA (1997)	Conservatively assumed to be present throughout the year

Table 4-2
Maximum Estimated Aquatic Plant Tissue PCOPEC Concentrations - Hudspn Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPECs	Maximum Sediment Concentration (mg/kg)[1]	Plant Uptake Factor	Plant Uptake Factor Source[2]	Maximum Plant Concentration (mg/kg)[3]
SVOCs				
Phenol	0.52	5.171	Travis and Arms (1988)	2.69E+00
Pesticides				
4,4'-DDD	0.074	ln(P)= 0.7524*ln(soil) - 2.5119[4]	USEPA, 2007g	1.14E-02
4,4'-DDE	0.046	ln(P)= 0.7524*ln(soil) - 2.5119[4]	USEPA, 2007g	8.00E-03
4,4'-DDT	0.051	ln(P)= 0.7524*ln(soil) - 2.5119[4]	USEPA, 2007g	8.64E-03
PCBs				
Aroclor 1248	1.30	0.0084	Travis and Arms (1988)	1.10E-02
Aroclor 1254	0.25	0.0036	Travis and Arms (1988)	8.95E-04
Aroclor 1260	0.59	0.0006	Travis and Arms (1988)	3.78E-04
Inorganics				
Antimony	270	ln(P)= 0.938*ln(soil) - 3.233[4]	USEPA, 2007g	7.53E+00
Arsenic	77.6	0.0375	USEPA, 2007g	2.91E+00
Barium	688	0.1560	USEPA, 2007g	1.07E+02
Beryllium	22.8	ln(P)= 0.7345*ln(soil) - 0.5361[4]	USEPA, 2007g	5.82E+00
Cadmium	3.9	ln(P)= 0.546*ln(soil) - 0.475[4]	USEPA, 2007g	1.31E+00
Chromium	15,700	0.0410	USEPA, 2007g	6.44E+02
Cobalt	67.3	0.0075	USEPA, 2007g	5.05E-01
Copper	611	ln(P)= 0.394*ln(soil) + 0.668[4]	USEPA, 2007g	2.44E+01
Lead	437	ln(P)=0.561*ln(soil) - 1.328[4]	USEPA, 2007g	8.02E+00
Manganese	1,210	0.0790	USEPA, 2007g	9.56E+01
Mercury	8.30	0.0375	USEPA, 1999	3.11E-01
Nickel	1,090	ln(P)= 0.748*ln(soil) - 2.223[4]	USEPA, 2007g	2.03E+01
Selenium	7.2	ln(P)= 1.104*ln(soil) - 0.677[4]	USEPA, 2007g	4.49E+00
Vanadium	4,870	0.0049	USEPA, 2007g	2.36E+01
Zinc	767	ln(P)=0.554*ln(soil) + 1.575[4]	USEPA, 2007g	1.92E+02

Notes:

[1] Maximum sediment concentration from Hudson Branch (see Table 2-3)

[2] Plant Uptake Factors from Travis and Arms (1988) calculated from following equation: Log PUF = 1.588 - 0.578(Log Kow).
Log Kow values from EPI Suite (version 4.0)

[3] Plant foliage concentrations presented on dry weight basis

[4] Regression equation cited in source used to calculate plant concentration based on maximum sediment concentration.

Example Calculation - Lead Concentration

$$\ln(P) = 0.561 * \ln(soil) - 1.328$$
$$\ln(P) = (0.561 * 6.08) - 1.328$$
$$\ln(P) = 3.411 - 1.328$$
$$P = 8.03 \text{ mg/kg}$$

Table 4-3
Maximum Estimated Terrestrial Plant Tissue PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Plant Uptake Factor	Plant Uptake Factor Source [2]	Maximum Plant Concentration (mg/kg) [3]
Former Lagoon Area				
Antimony	6.50	ln(P)= 0.938*ln(soil) - 3.233 [4]	USEPA, 2007g	2.28E-01
Chromium	51.4	0.0410	USEPA, 2007g	2.11E+00
Copper	91.3	ln(P)= 0.394*ln(soil) + 0.668 [4]	USEPA, 2007g	1.15E+01
Lead	14.7	ln(P)=0.561*ln(soil) - 1.328 [4]	USEPA, 2007g	1.20E+00
Manganese	408	0.0790	USEPA, 2007g	3.22E+01
Nickel	179	ln(P)= 0.748*ln(soil) - 2.223 [4]	USEPA, 2007g	5.24E+00
Vanadium	671	0.0049	USEPA, 2007g	3.25E+00
Zinc	49	ln(P)=0.554*ln(soil) + 1.575 [4]	USEPA, 2007g	4.17E+01
Eastern Storage Areas				
Aroclor 1248	1.90	0.0084	Travis and Arms (1988)	1.60E-02
Aroclor 1254	1.50	0.0036	Travis and Arms (1988)	5.37E-03
Antimony	14	ln(P)= 0.938*ln(soil) - 3.233 [4]	USEPA, 2007g	4.63E-01
Barium	683	0.1560	USEPA, 2007g	1.07E+02
Beryllium	35.5	ln(P)= 0.7345*ln(soil) - 0.5361 [4]	USEPA, 2007g	8.05E+00
Cadmium	2.8	ln(P)= 0.546*lh(soil) - 0.475 [4]	USEPA, 2007g	1.09E+00
Chromium	1,100	0.0410	USEPA, 2007g	4.51E+01
Cobalt	19.0	0.0075	USEPA, 2007g	1.43E-01
Copper	342	ln(P)= 0.394*ln(soil) + 0.668 [4]	USEPA, 2007g	1.94E+01
Lead	331	ln(P)=0.561*ln(soil) - 1.328 [4]	USEPA, 2007g	6.87E+00
Manganese	3,150	0.0790	USEPA, 2007g	2.49E+02
Nickel	1,110	ln(P)= 0.748*ln(soil) - 2.223 [4]	USEPA, 2007g	2.05E+01
Vanadium	4,875	0.0049	USEPA, 2007g	2.36E+01
Zinc	335	ln(P)=0.554*ln(soil) + 1.575 [4]	USEPA, 2007g	1.21E+02
Southern Area				
Antimony	7.30	ln(P)= 0.938*ln(soil) - 3.233 [4]	USEPA, 2007g	2.55E-01
Chromium	102	0.0410	USEPA, 2007g	4.18E+00
Lead	98.9	ln(P)=0.561*ln(soil) - 1.328 [4]	USEPA, 2007g	3.49E+00
Manganese	547	0.0790	USEPA, 2007g	4.32E+01
Mercury	0.52	0.0375	USEPA, 1999	1.95E-02
Nickel	189	ln(P)= 0.748*ln(soil) - 2.223 [4]	USEPA, 2007g	5.46E+00
Selenium	0.55	ln(P)= 1.104*ln(soil) - 0.677 [4]	USEPA, 2007g	2.63E-01
Vanadium	1,810	0.0049	USEPA, 2007g	8.78E+00
Zinc	476	ln(P)=0.554*ln(soil) + 1.575 [4]	USEPA, 2007g	1.47E+02
Hudson Branch Wetland				
Antimony	7.0	ln(P)= 0.938*ln(soil) - 3.233 [4]	USEPA, 2007g	2.45E-01
Barium	739	0.1560	USEPA, 2007g	1.15E+02
Beryllium	60.1	lh(P)= 0.7345*ln(soil) - 0.5361 [4]	USEPA, 2007g	1.19E+01
Cadmium	5.3	ln(P)= 0.546*ln(soil) - 0.475 [4]	USEPA, 2007g	1.55E+00
Chromium	8,940	0.0410	USEPA, 2007g	3.67E+02
Cobalt	87.1	0.0075	USEPA, 2007g	6.53E-01
Copper	887	ln(P)= 0.394*ln(soil) + 0.668 [4]	USEPA, 2007g	2.83E+01
Lead	760	ln(P)=0.561*ln(soil) - 1.328 [4]	USEPA, 2007g	1.09E+01
Manganese	1,680	0.0790	USEPA, 2007g	1.33E+02

Table 4-3
Maximum Estimated Terrestrial Plant Tissue PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [3]	Plant Uptake Factor	Plant Uptake Factor Source [2]	Maximum Plant Concentration (mg/kg) [3]
Mercury	0.52	0.0375	USEPA, 1999	1.95E-02
Nickel	3,360	ln(P)= 0.748*ln(soil) - 2.223 [4]	USEPA, 2007g	4.70E+01
Selenium	0.62	ln(P)= 1.104*ln(soil) - 0.677 [4]	USEPA, 2007g	3.00E-01
Vanadium	12,100	0.0049	USEPA, 2007g	5.87E+01
Zinc	1,310	ln(P)=0.554*ln(soil) + 1.575 [4]	USEPA, 2007g	2.58E+02

Notes:

[1] Maximum surface soil concentration from Table 2-4

[2] Plant Uptake Factors from Travis and Arms (1988) calculated from following equation: Log PUF = 1.588 - 0.578(Log Kow).
Log Kow values from EPI Suite (version 4.0)

[3] Plant foliage concentrations presented on dry weight basis

[4] Regression equation cited in source used to calculate plant concentration based on maximum sediment concentration.

Example Calculation - Lead Concentration (Eastern Storage Areas)

$$\ln(P) = 0.561*\ln(soil) - 1.328$$

$$\ln(P) = (0.561 * 5.802) - 1.328$$

Table 4-4
Maximum Estimated Aquatic Invertebrate PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Sediment PCOPECs	Maximum Sediment Concentration (mg/kg) [1]	TOC Normalized Sediment Concentration (mg/kg) [2]	Aquatic Invertebrate bSAF [3]	Aquatic Invertebrate Lipid Content (fraction) [4]	Maximum Aquatic Invertebrate Concentration (mg/kg) [5]
SVOCs					
Phenol [6]	0.52	5.196	1.00	0.031	4.60E-01
Pesticides					
4,4'-DDD	0.074	0.739	9.558	0.031	6.26E-01
4,4'-DDE	0.046	0.460	2.248	0.031	9.15E-02
4,4'-DDT	0.051	0.510	1.016	0.031	4.59E-02
PCB Aroclors					
Aroclor 1248	1.30	12.99	0.551	0.066	1.34E+00
Aroclor 1254	0.25	2.498	0.551	0.066	2.58E-01
Aroclor 1260	0.59	5.895	0.551	0.066	6.08E-01
Inorganics					
Antimony [6]	270	-	1.00	-	2.70E+02
Arsenic	77.6	-	0.127	-	9.86E+00
Barium [6]	688	-	1.00	-	6.88E+02
Beryllium [6]	22.8	-	1.00	-	2.28E+01
Cadmium	3.9	-	log(I)=0.692*log(S)+0.0395	-	2.81E+00
Chromium	15,700	-	0.066	-	1.04E+03
Cobalt [6]	67.3	-	1.00	-	6.73E+01
Copper	611	-	log(I)=0.278*log(S)+1.089	-	7.30E+01
Lead	437	-	0.066	-	2.88E+01
Manganese	1,210	-	1.00	-	1.21E+03
Mercury	8.30	-	1.081	-	8.97E+00
Nickel	1,090	-	0.134	-	1.46E+02
Selenium [6]	7.2	-	1.00	-	7.20E+00
Vanadium [6]	4,870	-	1.00	-	4.87E+03
Zinc	767	-	0.84	-	6.44E+02

Notes:

[1] Maximum sediment concentration (dry weight) from Table 2-2

[2] Maximum sediment concentration (dry weight) divided by mean TOC (dry weight) of sediment (10.008%).

[3] Organics from BSAF database (USEPA, 2007h) - mean of crayfish (DDD, DDE, DDT) or emergent invertebrate (PCBs)
Converted to dry weight by dividing by percent solids (0.35) of aquatic invertebrates
Inorganics from Bechtel Jacobs (1998). Regression equations used where applicable (I = invertebrate; S = sediment)
Chromium from USEPA (1999)

[4] BSAF database - Mean lipid content of crayfish or freshwater emerging insects .

[5] TOC normalized sediment concentration * aquatic invertebrate BSAF * aquatic invertebrate lipid concent (dry weight).

[6] BSAF not available from USEPA (2007h). Assumed BSAF of 1.00.

Table 4-5
Maximum Estimated Terrestrial Invertebrate PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Soil to Earthworm BAF	Bioaccumulation Factor (BAF) Source [2]	Maximum Invertebrate Concentration (mg/kg) [3]
Former Lagoon Area				
Antimony	6.50	1.000	USEPA, 2007g	6.50E+00
Chromium	51.4	0.306	USEPA, 2007g	1.57E+01
Copper	91.3	0.515	USEPA, 2007g	4.70E+01
Lead	14.7	ln(I)=0.807*ln(soil) - 0.218 [7]	USEPA, 2007g	7.04E+00
Manganese	408	ln(I)=0.682*ln(soil) - 0.809 [4]	USEPA, 2007g	2.69E+01
Nickel	179	0.003	USEPA, 2007g	5.91E-01
Vanadium	671	0.042	USEPA, 2007g	2.82E+01
Zinc	49	ln(I)=0.328*ln(soil) + 4.449 [4]	USEPA, 2007g	3.06E+02
Eastern Storage Areas				
Aroclor 1248	1.90	ln(I)=1.36*ln(oil) + 1.41 [4]	Sample et al. (1998)	9.81E+00
Aroclor 1254	1.50	ln(I)=1.36*ln(soil) + 1.41 [4]	Sample et al. (1998)	7.11E+00
Antimony	14	1.00	USEPA, 2007g	1.38E+01
Barium	683	0.091	USEPA, 2007g	6.22E+01
Beryllium	35.5	0.045	USEPA, 2007g	1.60E+00
Cadmium	2.8	ln(I)=0.795*ln(soil) + 2.114 [4]	USEPA, 2007g	1.88E+01
Chromium	1,100	0.306	USEPA, 2007g	3.37E+02
Cobalt	19.0	0.122	USEPA, 2007g	2.32E+00
Copper	342	0.515	USEPA, 2007g	1.76E+02
Lead	331	ln(I)=0.807*ln(soil) - 0.218 [7]	USEPA, 2007g	8.69E+01
Manganese	3,150	ln(I)=0.682*ln(s6il) - 0.809 [4]	USEPA, 2007g	1.08E+02
Nickel	1,110	0.003	USEPA, 1999	3.66E+00
Vanadium	4,875	0.042	USEPA, 2007g	2.05E+02
Zinc	335	ln(I)=0.328*ln(soil) + 4.449 [4]	USEPA, 2007g	5.76E+02
Southern Area				
Antimony	7.30	1.00	USEPA, 2007g	7.30E+00
Chromium	102	0.306	USEPA, 2007g	3.12E+01
Lead	98.9	ln(I)=0.807*ln(soil) - 0.218 [7]	USEPA, 2007g	3.28E+01
Manganese	547	ln(I)=0.682*ln(soil) - 0.809 [4]	USEPA, 2007g	3.28E+01
Mercury	0.52	0.007	USEPA, 1999	3.48E-03
Nickel	189	0.003	USEPA, 1999	6.24E-01
Selenium	0.55	ln(I)=0.733*ln(soil)-0.075 [4]	USEPA, 2007g	5.99E-01
Vanadium	1,810	0.042	USEPA, 2007g	7.60E+01
Zinc	476	ln(I)=0.328*ln(soil) + 4.449 [4]	USEPA, 2007g	6.46E+02
Hudson Branch Wetland				
Antimony	7.0	1.00	USEPA, 2007g	7.00E+00
Barium	739	0.091	USEPA, 2007g	6.72E+01
Beryllium	60.1	0.045	USEPA, 2007g	2.70E+00
Cadmium	5.3	ln(I)=0.795*ln(soil) + 2.114	USEPA, 2007g	3.12E+01
Chromium	8,940	0.306	USEPA, 2007g	2.74E+03
Cobalt	87.1	0.122	USEPA, 2007g	1.06E+01
Copper	887	0.515	USEPA, 2007g	4.57E+02
Lead	760	ln(I)=0.807*ln(soil) - 0.218 [7]	USEPA, 2007g	1.70E+02
Manganese	1,680	ln(I)=0.682*ln(soil) - 0.809 [4]	USEPA, 2007g	7.05E+01

Table 4-5
Maximum Estimated Terrestrial Invertebrate PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Soil to Earthworm BAF	Bioaccumulation Factor (BAF) Source [2]	Maximum Invertebrate Concentration (mg/kg) [3]
Mercury	0.52	0.007	USEPA, 1999	3.48E-03
Nickel	3,360	0.003	USEPA, 1999	1.11E+01
Selenium	0.62	ln(I)=0.733*ln(soil)-0.075 [4]	USEPA, 2007g	6.54E-01
Vanadium	12,100	0.042	USEPA, 2007g	5.08E+02
Zinc	1,310	ln(I)=0.328*ln(soil) + 4.449 [4]	USEPA, 2007g	9.01E+02

Notes:

[1] Maximum surface soil concentration from Table 2-4

[2] BAFs from Sample et al. (1988) represent geometric means.

[3] Invertebrate concentrations presented on dry weight basis

[4] Regression equation cited in source used to calculate plant concentration based on maximum suface soil concentration.

Example Calculation - Lead Concentration (Eastern Storage Areas)

ln(i) = 0.807*ln(soil) - L218

ln (I) = (0.807 * 5.802) - 0.218

ln (I) = 4.682 - 0.218

I = 86.9 mg/kg

Table 4-6
Maximum Estimated Small Mammal PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Soil to Small Mammal BAF	Bioaccumulation Factor (BAF) Source [2]	Maximum Small Mammal Concentration (mg/kg) [3]
Former Lagoon Area				
Antimony	6.50	$M=0.001*50*C_{diet}$ [4]	USEPA, 2007g	3.25E-01
Chromium	51.4	$\ln(M)=0.7338*\ln(S)-1.4599$ [5]	USEPA, 2007g	4.18E+00
Copper	91.3	$\ln(M)=0.1444*\ln(S)+2.042$ [5]	USEPA, 2007g	1.48E+01
Lead	14.7	$\ln(M)=0.4422*\ln(S)+0.0761$ [5]	USEPA, 2007g	3.54E+00
Manganese	408	0.0205	USEPA, 2007g	8.36E+00
Nickel	179	$\ln(M)=0.4658*\ln(S)-0.2462$ [5]	USEPA, 2007g	8.76E+00
Vanadium	671	0.0123	USEPA, 2007g	8.25E+00
Zinc	49	$\ln(M)=0.0706*\ln(S)+4.3632$ [5]	USEPA, 2007g	1.03E+02
Eastern Storage Areas				
Aroclor 1248	1.90	0.0015	Travis and Arms (1988)	8.91E-03
Aroclor 1254	1.50	0.0065	Travis and Arms (1988)	3.05E-02
Antimony	14	$M=0.001*50*C_{diet}$ [4]	USEPA, 2007g	6.90E-01
Barium	683	$M=0.00015*50*C_{diet}$ [4]	USEPA, 2007g	4.67E-01
Beryllium	35.5	$M=0.001*50*C_{diet}$ [4]	USEPA, 2007g	8.00E-02
Cadmium	2.8	$\ln(M)=0.4723*\ln(S)-1.2571$ [5]	USEPA, 2007g	4.63E-01
Chromium	1,100	$\ln(M)=0.7338*\ln(S)-1.4599$ [5]	USEPA, 2007g	3.96E+01
Cobalt	19.0	$\ln(M)=1.307*\ln(S)-4.4669$ [5]	USEPA, 2007g	5.39E-01
Copper	342	$\ln(M)=0.1444*\ln(S)+2.042$ [5]	USEPA, 2007g	1.79E+01
Lead	331	$\ln(M)=0.4422*\ln(S)+0.0761$ [5]	USEPA, 2007g	1.40E+01
Manganese	3,150	0.0205	USEPA, 2007g	6.46E+01
Nickel	1,110	$\ln(M)=0.4658*\ln(S)-0.2462$ [5]	USEPA, 2007g	2.05E+01
Vanadium	4,875	0.0123	USEPA, 2007g	6.00E+01
Zinc	335	$\ln(M)=0.0706*\ln(S)+4.3632$ [5]	USEPA, 2007h	1.18E+02
Southern Area				
Antimony	7.30	$M=0.001*50*C_{diet}$ [4]	USEPA, 2007g	3.65E-01
Chromium	102	$\ln(M)=0.7338*\ln(S)-1.4599$ [5]	USEPA, 2007g	6.92E+00
Lead	98.9	$\ln(M)=0.4422*\ln(S)+0.0761$ [5]	USEPA, 2007g	8.23E+00
Manganese	547	0.0205	USEPA, 2007g	1.12E+01
Mercury	0.52	0.020	USEPA, 1999	1.04E-02
Nickel	189	$\ln(M)=0.4658*\ln(S)-0.2462$ [5]	USEPA, 2007g	8.98E+00
Selenium	0.55	$\ln(M)=0.3764*\ln(S)-0.4158$ [5]	USEPA, 2007g	5.27E-01
Vanadium	1,810	0.0123	USEPA, 2007g	2.23E+01
Zinc	476	$\ln(M)=0.0706*\ln(S)+4.3632$ [5]	USEPA, 2007g	1.21E+02
Hudson Branch Wetland				
Antimony	7.0	$M=0.001*50*C_{diet}$ [4]	USEPA, 2007g	3.50E-01
Barium	739	$M=0.00015*50*C_{diet}$ [4]	USEPA, 2007g	5.04E-01
Beryllium	60.1	$M=0.001*50*C_{diet}$ [4]	USEPA, 2007g	1.35E-01
Cadmium	5.3	$\ln(M)=0.4723*\ln(S)-1.2571$ [5]	USEPA, 2007g	6.25E-01
Chromium	8,940	$\ln(M)=0.7338*\ln(S)-1.4599$ [5]	USEPA, 2007g	1.84E+02
Cobalt	87.1	$\ln(M)=1.307*\ln(S)-4.4669$ [5]	USEPA, 2007g	3.94E+00
Copper	887	$\ln(M)=0.1444*\ln(S)+2.042$ [5]	USEPA, 2007g	2.05E+01
Lead	760	$\ln(M)=0.4422*\ln(S)+0.0761$ [5]	USEPA, 2007g	2.03E+01
Manganese	1,680	0.0205	USEPA, 2007g	3.44E+01

Table 4-6
Maximum Estimated Small Mammal PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Soil to Small Mammal BAF	Bioaccumulation Factor (BAF) Source [2]	Maximum Small Mammal Concentration (mg/kg) [3]
Mercury	0.52	0.020	USEPA, 1999	1.04E-02
Nickel	3,360	$\ln(M)=0.4658*\ln(S)-0.2462$ [5]	USEPA, 2007g	3.43E+01
Selenium	0.62	$\ln(M)=0.3764*\ln(S)-0.4158$ [5]	USEPA, 2007g	5.51E-01
Vanadium	12,100	0.0123	USEPA, 2007g	1.49E+02
Zinc	1,310	$\ln(M)=0.0706*\ln(S)+4.3632$ [5]	USEPA, 2007g	1.30E+02

Notes:

[1] Maximum surface soil concentration from Table 2-4

[2] Bioaccumulation Factors calculated from Travis and Arms (1988) where biotransfer factor: Log BTF = -7.6 + Log K_{ow}. BAF = BTF multiplied by short-tailed shrew daily ingestion rate (0.027 kg/day). Converted to dry weight basis by dividing by % solids (0.32) of small mammals (USEPA, 1993).
Log K_{ow} values from EPI Suite (version 4.0)

[3] Small mammal concentrations presented on dry weight basis.

[4] BAF value for this compound multiplied by concentration in diet (100% terrestrial invertebrates). Invertebrate concentrations from Table 4-5 .

[5] Regression equation used to calculate small mammal concentration (M) based on maximum soil concentration (S).

[6] BAF value for total mercury (USEPA, 1999).

Table 4-7
Muskrat - Maximum Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Maximum Sediment Concentration (mg/kg) [1]	Maximum Aquatic Vegetation Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Sediment Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]	Sediment Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
SVOCs													
Phenol	5.20E-01	2.69E+00	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	1.58E-01	7.32E-04	0.00E+00	1.59E-01
Pesticides													
4,4'-DDD	7.40E-02	1.14E-02	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	6.73E-04	1.04E-04	0.00E+00	7.77E-04
4,4'-DDE	4.60E-02	8.00E-03	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	4.70E-04	6.47E-05	0.00E+00	5.35E-04
4,4'-DDT	5.10E-02	8.64E-03	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	5.08E-04	7.18E-05	0.00E+00	5.80E-04
PCBs													
Aroclor 1248	1.30E+00	1.10B-02	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	6.45E-04	1.83E-03	0.00E+00	2.47E-03
Aroclor 1254	2.50E-01	8.95E-04	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	5.26E-05	3.52E-04	0.00E+00	4.04E-04
Aroclor 1260	5.90E-01	3.78E-04	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	2.22E-05	8.30E-04	0.00E+00	8.53E-04
Inorganics													
Antimony	2.70E+02	7.53E+00	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	4.43E-01	3.80E-01	0.00E+00	8.23E-01
Arsenic	7.76E+01	2.91E+00	3.20E-03	0.0794	0.0019	0.130	1.35	1.00	1.00	1.71E-01	1.09E-01	3.08E-04	2.81E-01
Barium	6.88E+02	1.07E+02	1.19E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	6.31E+00	9.68E-01	1.15E-02	7.29E+00
Beryllium	2.28E+01	5.82E+00	2.60E-03	0.0794	0.0019	0.130	1.35	1.00	1.00	3.42E-01	3.21E-02	2.50E-04	3.74E-01
Cadmium	3.90E+00	1.31E+00	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	7.69E-02	5.49E-03	0.00E+00	8.24E-02
Chromium	1.57E+04	6.44E+02	1.01E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	3.79E+01	2.21E+01	9.73E-03	6.00E+01
Cobalt	6.73E+01	5.05E-01	1.01E-02	0.0794	0.0019	0.130	1.35	1.00	1.00	2.97E-02	9.47E-02	9.73E-04	1.25E-01
Copper	6.11E+02	2.44E+01	2.32E-02	0.0794	0.0019	0.130	1.35	1.00	1.00	1.44E+00	8.60E-01	2.23E-03	2.30E+00
Lead	4.37E+02	8.02E+00	3.40E-03	0.0794	0.0019	0.130	1.35	1.00	1.00	4.72E-01	6.14E-01	3.27E-04	1.09E+00
Manganese	1.21E+03	9.56E+01	1.94E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	5.62E+00	1.70E+00	1.87E-02	7.34E+00
Mercury	8.30E+00	3.11E-01	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	1.83E-02	1.17E-02	0.00E+00	3.00E-02
Nickel	1.09E+03	2.03E+01	1.92E-02	0.0794	0.0019	0.130	1.35	1.00	1.00	1.19E+00	1.53E+00	1.85E-03	2.73E+00
Selenium	7.20E+00	4.49E+00	4.40E-03	0.0794	0.0019	0.130	1.35	1.00	1.00	2.64E-01	1.01E-02	4.24E-04	2.75E-01
Vanadium	4.87E+03	2.36E+01	4.13E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	1.39E+00	6.85E+00	3.98E-02	8.28E+00
Zinc	7.67E+02	1.92E+02	2.87E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	1.13E+01	1.08E+00	2.76E-02	1.24E+01

Notes:

[1] Maximum sediment concentration from Hudson Branch (see Table 2-2).

[2] Maximum aquatic vegetation concentration from Table 4-2.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum sediment concentration * sediment ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum vegetation, sediment and surface water exposure doses.

Table 4-8
Mallard - Maximum Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facilify
Newfield, New Jersey

Sediment PCOPEC	Maximum Sediment Concentration (mg/kg)[3]	Maximum Aquatic Vegetation Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Sediment Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]	Sediment Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
SVOCs													
Phenol	5.20E-01	2.69E+00	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	1.92E-01	7.50E-04	0.00E+00	1.93E-01
Pesticides													
4,4'-DDD	7.40E-02	1.14E-02	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	8.18E-04	1.07E-04	0.00E+00	9.25E-04
4,4'-DDE	4.60E-02	8.00E-03	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	5.72E-04	6.63E-05	0.00E+00	6.38E-04
4,4'-DDT	5.10E-02	8.64E-03	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	6.18E-04	7.36E-05	0.00E+00	6.92E-04
PCBs													
Aroclor 1248	1.30E+00	1.10E-02	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	7.85E-04	1.88E-03	0.00E+00	2.66E-03
Aroclor 1254	2.50E-01	8.95E-04	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	6.40E-05	3.61E-04	0.00E+00	4.25E-04
Aroclor 1260	5.90E-01	3.78E-04	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	2.70E-05	8.51E-04	0.00E+00	8.78E-04
Inorganics													
Antimony	2.70E+02	7.53E+00	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	5.38E-01	3.89E-01	0.00E+00	9.28E-01
Arsenic	7.76E+01	2.91E+00	3.20E-03	0.0744	0.0015	0.058	1.04	1.00	1.00	2.08E-01	1.12E-01	1.78E-04	3.20E-01
Barium	6.88E+02	1.07E+02	1.19E-01	0.0744	0.0015	0.058	1.04	1.00	1.00	7.68E+00	9.92E-01	6.64E-03	8.68E+00
Beryllium	2.28E+01	5.82E+00	2.60E-03	0.0744	0.0015	0.058	1.04	1.00	1.00	4.16E-01	3.29E-02	1.45E-04	4.49E-01
Cadmium	3.90E+00	1.31E+00	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	9.35E-02	5.63E-03	0.00E+00	9.92E-02
Chromium	1.57E+04	6.44E+02	1.01E-01	0.0744	0.0015	0.058	1.04	1.00	1.00	4.60E+01	2.26E+01	5.63E-03	6.87E+01
Cobalt	6.73E+01	5.05E-01	1.01E-02	0.0744	0.0015	0.058	1.04	1.00	1.00	3.61E-02	9.71E-02	5.63E-04	1.34E-01
Copper	6.11E+02	2.44E+01	2.32E-02	0.0744	0.0015	0.058	1.04	1.00	1.00	1.75E+00	8.81E-01	1.29E-03	2.63E+00
Lead	4.37E+02	8.02E+00	3.40E-03	0.0744	0.0015	0.058	1.04	1.00	1.00	5.74E-01	6.30E-01	1.90E-04	1.20E+00
Manganese	1.21E+03	9.56E+01	1.94E-01	0.0744	0.0015	0.058	1.04	1.00	1.00	6.84E+00	1.75E+00	1.08E-02	8.59E+00
Mercury	8.30E+00	3.11E-01	0.00E+00	0.0744	0.0015	0.058	1.04	1.00	1.00	2.23E-02	1.20E-02	0.00E+00	3.42E-02
Nickel	1.09E+03	2.03E+01	1.92E-02	0.0744	0.0015	0.058	1.04	1.00	1.00	1.45E+00	1.57E+00	1.07E-03	3.02E+00
Selenium	7.20E+00	4.49E+00	4.40E-03	0.0744	0.0015	0.058	1.04	1.00	1.00	3.21E-01	1.04E-02	2.45E-04	3.32E-01
Vanadium	4.87E+03	2.36E+01	4.13E-01	0.0744	0.0015	0.058	1.04	1.00	1.00	1.69E+00	7.02E+00	2.30E-02	8.74E+00
Zinc	7.67E+02	1.92E+02	2.87E-01	0.0744	0.0015	0.058	1.04	1.00	1.00	1.37E+01	1.11E+00	1.60E-02	1.48E+01

Notes:

[1] Maximum sediment concentration from Hudson Branch (see Table 2-2).

[2] Maximum aquatic vegetation concentration from Table 4-2.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum sediment concentration * sediment ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum vegetation, sediment and surface water exposure doses.

Tabic 4-9
Little Brown Bat - Maximum Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Maximum Aquatic Invertebrate Concentration (mg/kg)[1]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[3]	Surface Water Ingestion Rate (L/day)[3]	Body Weight (kg)[3]	Area Use Factor[3]	Temporal Use Factor[3]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[4]	Surface Water Exposure Dose (mg/kg/BW-day)[5]	Total Maximum Exposure Dose (mg/kg/BW-day)[6]
SVOCs										
Phenol	4.60E-01	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	9.82E-02	0.00E+00	9.82E-02
Pesticides										
4,4'-DDD	6.26E-01	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	1.34E-01	0.00E+00	1.34E-01
4,4'-DDE	9.15E-02	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	1.95E-02	0.00E+00	1.95E-02
4,4'-DDT	4.59E-02	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	9.78E-03	0.00E+00	9.78E-03
PCBs										
Aroclor 1248	1.34E+00	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	2.86E-01	0.00E+00	2.86E-01
Aroclor 1254	2.58E-01	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	5.50E-02	0.00E+00	5.50E-02
Aroclor 1260	6.08E-01	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	1.30E-01	0.00E+00	1.30E-01
Inorganics										
Antimony	2.70E+02	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	5.76E+01	0.00E+00	5.76E+01
Arsenic	9.86E+00	3.20E-03	0.0016	0.001	0.0075	1.00	1.00	2.10E+00	4.27E-04	2.10E+00
Barium	6.88E+02	1.19E-01	0.0016	0.001	0.0075	1.00	1.00	1.47E+02	1.59E-02	1.47E+02
Beryllium	2.28E+01	2.60E-03	0.0016	0.001	0.0075	1.00	1.00	4.86E+00	3.47E-04	4.86E+00
Cadmium	2.81E+00	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	5.99E-01	0.00E+00	5.99E-01
Chromium	1.04E+03	1.01E-01	0.0016	0.001	0.0075	1.00	1.00	2.21E+02	1.35E-02	2.21E+02
Cobalt	6.73E+01	1.01E-02	0.0016	0.001	0.0075	1.00	1.00	1.44E+01	1.35E-03	1.44E+01
Copper	7.30E+01	2.32E-02	0.0016	0.001	0.0075	1.00	1.00	1.56E+01	3.09E-03	1.56E+01
Lead	2.88E+01	3.40E-03	0.0016	0.001	0.0075	1.00	1.00	6.15E+00	4.53E-04	6.15E+00
Manganese	1.21E+03	1.94E-01	0.0016	0.001	0.0075	1.00	1.00	2.58E+02	2.59E-02	2.58E+02
Mercury	8.97E+00	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	1.91E+00	0.00E+00	1.91E+00
Nickel	1.46E+02	1.92E-02	0.0016	0.001	0.0075	1.00	1.00	3.12E+01	2.56E-03	3.12E+01
Selenium	7.20E+00	4.40E-03	0.0016	0.001	0.0075	1.00	1.00	1.54E+00	5.87E-04	1.54E+00
Vanadium	4.87E+03	4.13E-01	0.0016	0.001	0.0075	1.00	1.00	1.04E+03	5.51E-02	1.04E+03
Zinc	6.44E+02	2.87E-01	0.0016	0.001	0.0075	1.00	1.00	1.37E+02	3.83E-02	1.37E+02

Notes:

[1] Maximum aquatic invertebrate concentration from Table 4-4.

[2] Maximum surface water concentration from Table 2-1.

[3] from Table 4-1.

[4] Maximum aquatic invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[5] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Sum of maximum aquatic invertebrate and surface water exposure doses.

Table 4-10
Tree Swallow - Maximum Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
- Newfield, New Jersey

Sediment PCOPEC	Maximum Aquatic Invertebrate Concentration (mg/kg)[1]	Maximum Surface Water Concentration (mg/L)[2]	Food Ingestion Rate (kg/day)[3]	Surface Water Ingestion Rate (L/day)[3]	Body Weight (kg)[3]	Area Use Factor[3]	Temporal Use Factor[3]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[4]	Surface Water Exposure Dose (mg/kg/BW-day)[5]	Total Maximum Exposure Dose (mg/kg/BW-day)[6]
SVOCs										
Phenol	4.60E-01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	2.54E-01	0.00E+00	2.54E-01
Pesticides										
4,4'-DDD	6.26E-01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	3.46E-01	0.00E+00	3.46E-01
4,4'-DDE	9.15E-02	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	5.06E-02	0.00E+00	5.06E-02
4,4'-DDT	4.59E-02	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	2.53E-02	0.00E+00	2.53E-02
PCBs										
Aroclor 1248	1.34E+00	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	7.40E-01	0.00E+00	7.40E-01
Aroclor 1254	2.58E-01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	1.42E-01	0.00E+00	1.42E-01
Aroclor 1260	6.08E-01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	3.36E-01	0.00E+00	3.36E-01
Inorganics										
Antimony	2.70E+02	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	1.49E+02	0.00E+00	1.49E+02
Arsenic	9.86E+00	3.20E-03	0.0116	0.004	0.0210	1.00	1.00	5.44E+00	6.10E-04	5.44E+00
Barium	6.88E+02	1.19E-01	0.0116	0.004	0.0210	1.00	1.00	3.80E+02	2.27E-02	3.80E+02
Beryllium	2.28E+01	2.60E-03	0.0116	0.004	0.0210	1.00	1.00	1.26E+01	4.95E-04	1.26E+01
Cadmium	2.81E+00	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	1.55E+00	0.00E+00	1.55E+00
Chromium	1.04E+03	1.01E-01	0.0116	0.004	0.0210	1.00	1.00	5.72E+02	1.92E-02	5.72E+02
Cobalt	6.73E+01	1.01E-02	0.0116	0.004	0.0210	1.00	1.00	3.72E+01	1.92E-03	3.72E+01
Copper	7.30E+01	2.32E-02	0.0116	0.004	0.0210	1.00	1.00	4.03E+01	4.42E-03	4.03E+01
Lead	2.88E+01	3.40E-03	0.0116	0.004	0.0210	1.00	1.00	1.59E+01	6.48E-04	1.59E+01
Manganese	1.21E+03	1.94E-01	0.0116	0.004	0.0210	1.00	1.00	6.68E+02	3.70E-02	6.68E+02
Mercury	8.97E+00	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	4.96E+00	0.00E+00	4.96E+00
Nickel	1.46E+02	1.92E-02	0.0116	0.004	0.0210	1.00	1.00	8.07E+01	3.66E-03	8.07E+01
Selenium	7.20E+00	4.40E-03	0.0116	0.004	0.0210	1.00	1.00	3.98E+00	8.38E-04	3.98E+00
Vanadium	4.87E+03	4.13E-01	0.0116	0.004	0.0210	1.00	1.00	2.69E+03	7.87E-02	2.69E+03
Zinc	6.44E+02	2.87E-01	0.0116	0.004	0.0210	1.00	1.00	3.56E+02	5.47E-02	3.56E+02

Notes:

[1] Maximum aquatic invertebrate concentration from Table 4-4.

[2] Maximum surface water concentration from Table 2-1.

[3] from Table 4-1.

[4] Maximum aquatic invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[5] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Sum of maximum aquatic invertebrate and surface water exposure doses.

Table 4-11
Mourning Dove - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Terrestrial Vegetation Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (l./day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factpr[4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Antimony	6.50E+00	2.28E-01	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	3.16E-02	8.13E-02	0.00E+00	1.13E-01
Chromium	5.14E+01	2.11E+00	1.01E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	2.92E-01	6.43E-01	1.00E-01	1.03E+00
Copper	9.13E+01	1.15E+01	2.32E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.60E+00	1.14E+00	2.30E-02	2.76E+00
Lead	1.47E+01	1.20E+00	3.40E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	1.66E-01	1.84E-01	3.37E-03	3.53E-01
Manganese	4.08E+02	3.22E+01	1.94E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	4.46E+00	5.10E+00	1.92E-01	9.75E+00
Nickel	1.79E+02	5.24E+00	1.92E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	7.25E-01	2.24E+00	1.90E-02	2.98E+00
Vanadium	6.71E+02	3.25E+00	4.13E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	4.50E-01	8.39E+00	4.10E-01	9.25E+00
Zinc	4.89E+01	4.17E+01	2.87E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	5.77E+00	6.11E-01	2.85E-01	6.66E+00
Eastern Storage Areas													
Aroclor 1248	1.90E+00	1.60E-02	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	2.22E-03	2.38E-02	0.00E+00	2.60E-02
Aroclor 1254	1.50E+00	5.37E-03	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	7.43E-04	1.88E-02	0.00E+00	1.95E-02
Antimony	1.38E+01	4.63E-01	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	6.40E-02	1.73E-01	0.00E+00	2.36E-01
Barium	6.83E+02	1.07E+02	1.19E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.47E+01	8.54E+00	1.18E-01	2.34E+01
Beryllium	3.55E+01	8.05E+00	2.60E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	1.11E+00	4.44E-01	2.58E-03	1.56E+00
Cadmium	2.80E+00	1.09E+00	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	1.51E-01	3.50E-02	0.00E+00	1.86E-01
Chromium	1.10E+03	4.51E+01	1.01E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	6.24E+00	1.38E+01	1.00E-01	2.01E+01
Cobalt	1.90E+01	1.43E-01	1.01E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.97E-02	2.38E-01	1.00E-02	2.67E-01
Copper	3.42E+02	1.94E+01	2.32E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	2.69E+00	4.28E+00	2.30E-02	6.99E+00
Lead	3.31E+02	6.87E+00	3.40E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	9.50E-01	4.14E+00	3.37E-03	5.09E+00
Manganese	3.15E+03	2.49E+02	1.94E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	3.44E+01	3.94E+01	1.92E-01	7.40E+01
Nickel	1.11E+03	2.05E+01	1.92E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	2.84E+00	1.39E+01	1.90E-02	1.67E+01
Vanadium	4.88E+03	2.36E+01	4.13E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	3.27E+00	6.09E+01	4.10E-01	6.46E+01
Zinc	3.35E+02	1.21E+02	2.87E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.67E+01	4.19E+00	2.85E-01	2.12E+01
Southern Area													
Antimony	7.30E+00	2.55E-01	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	3.52E-02	9.13E-02	0.00E+00	1.26E-01
Chromium	1.02E+02	4.18E+00	1.01E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	5.79E-01	1.28E+00	1.00E-01	1.95E+00
Lead	9.89E+01	3.49E+00	3.40E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	4.82E-01	1.24E+00	3.37E-03	1.72E+00
Manganese	5.47E+02	4.32E+01	1.94E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	5.98E+00	6.84E+00	1.92E-01	1.30E+01
Mercury	5.20E-01	1.95E-02	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	2.70E-03	6.50E-03	0.00E+00	9.20E-03
Nickel	1.89E+02	5.46E+00	1.92E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	7.56E-01	2.36E+00	1.90E-02	3.14E+00
Selenium-	5.50E-01	2.63E-01	4.40E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	3.63E-02	6.88E-03	4.36E-03	4.76E-02
Vanadium	1.81E+03	8.78E+00	4.13E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.21E+00	2.26E+01	4.10E-01	2.42E+01
Zinc	4.76E+02	1.47E+02	2.87E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	2.03E+01	5.95E+00	2.85E-01	2.65E+01
Hudson Branch Wetland													
Antimony	7.00E+00	2.45E-01	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	3.38E-02	8.75E-02	0.00E+00	1.21E-01
Barium	7.39E+02	1.15E+02	1.19E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.59E+01	9.24E+00	1.18E-01	2.53E+01
Beryllium	6.01E+01	1.19E+01	2.60E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	1.64E+00	7.51E-01	2.58E-03	2.39E+00
Cadmium	5.30E+00	1.55E+00	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	2.14E-01	6.63E-02	0.00E+00	2.80E-01
Chromium	8.94E+03	3.67E+02	1.01E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	5.07E+01	1.12E+02	1.00E-01	1.63E+02
Cobalt	8.71E+01	6.53E-01	1.01E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	9.04E-02	1.09E+00	1.00E-02	1.19E+00
Copper	8.87E+02	2.83E+01	2.32E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	3.91E+00	1.11E+01	2.30E-02	1.50E+01

Table 4-i1
Mourning Dove - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Terrestrial Vegetation Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Faetor[4]	Temporal Use Factor[4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Lead	7.60E+02	1.09E+01	3.40E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	L51E+00	9.50E+00	3.37E-03	1.10E+01
Manganese	1.68E+03	1.33E+02	1.94E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	i.84E+01	2.10E+01	L92E-01	3.96E+01
Mercury	5.20E-01	1.95E-02	0.00E+00	0.0166	0.0015	0.119	0.120	1.00	1.00	2.70E-03	6.50E-03	0.00E+00	9.20E-03
Nickel	3.36E+03	4.70E+01	1.92E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	6.50E+00	4.20E+01	1.90E-02	4.85E+01
Selenium	6.20E-01	3.00E-01	4.40E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	4.15E-02	7.75E-03	4.36E-03	5.36E-02
Vanadium	1.21E+04	5.87E+01	4.13E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	8.12E+00	1.51E+02	4.10E-01	1.60E+02
Zinc	1.31E+03	2.58E+02	2.87E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	3.56E+01	1.64E+01	2.85E-01	5.23E+01

Notes:

[1] Maximum surface soil concentrations from Table 2-4.

[2] Maximum terrestrial vegetation concentrations from Table 4-3.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water conceniration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum vegetation, surface soil and surface water exposure doses.

Table 4-12
White-Footed Mouse - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Terrestrial Vegetation Concentration (mg/kg)[2]	Maximuin Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Antimony	6.50E+00	2.28E-01	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	3.11E-02	1.77E-02	0.00E+00	4.89E-02
Chromium	5.14E+01	2.11E+00	1.01E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	2.87E-01	1.40E-01	3.21E-02	4.60E-01
Copper	9.13E+01	1.15E+01	2.32E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	1.57E+00	2.49E-01	7.38E-03	1.83E+00
Lead	1.47E+01	1.20E+00	3.40E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	1.63E-01	4.01E-02	1.08E-03	2.04E-01
Manganese	4.08E+02	3.22E+01	1.94E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	4.40E+00	1.11E+00	6.17E-02	5.57E+00
Nickel	1.79E+02	5.24E+00	1.92E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	7.15E-01	4.88E-01	6.11E-03	1.21E+00
Vanadium	6.71E+02	3.25E+00	4.13E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	4.44E-01	1.83E+00	1.31E-01	2.41E+00
Zinc	4.89E+01	4.17E+01	2.87E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	5.68E+00	1.33E-01	9.13E-02	5.91E+00
Eastern Storage Areas													
Aroclor 1248	1.90E+00	1.60E-02	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	2.19E-03	5.18E-03	0.00E+00	7.37E-03
Aroclor 1254	1.50E+00	5.37E-03	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	7.32E-04	4.09E-03	0.00E+00	4.82E-03
Antimony	1.38E+01	4.63E-01	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	6.31E-02	3.76E-02	0.00E+00	1.01E-01
Barium	6.83E+02	1.07E+02	1.19E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	1.45E+01	1.86E+00	3.79E-02	1.64E+01
Beryllium	3.55E+01	8.05E+00	2.60E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	1.10E+00	9.68E-02	8.27E-04	1.20E+00
Cadmium	2.80E+00	1.09E+00	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	1.49E-01	7.64E-03	0.00E+00	1.56E-01
Chromium	1.10E+03	4.51E+01	1.01E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	6.15E+00	3.00E+00	3.21E-02	9.18E+00
Cobalt	1.90E+01	1.43E-01	1.01E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	1.94E-02	5.18E-02	3.21E-03	7.45E-02
Copper	3.42E+02	1.94E+01	2.32E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	2.65E+00	9.33E-01	7.38E-03	3.59E+00
Lead	3.31E+02	6.87E+00	3.40E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	9.37E-01	9.03E-01	1.08E-03	1.84E+00
Manganese	3.15E+03	2.49E+02	1.94E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	3.39E+01	8.59E+00	6.17E-02	4.26E+01
Nickel	1.11E+03	2.05E+01	1.92E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	2.80E+00	3.03E+00	6.11E-03	5.83E+00
Vanadium	4.88E+03	2.36E+01	4.13E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	3.22E+00	1.33E+01	1.31E-01	1.67E+01
Zinc	3.35E+02	1.21E+02	2.87E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	1.65E+01	9.14E-01	9.13E-02	1.75E+01
Southern Area													
Antimony	7.30E+00	2.55E-01	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	3.47E-02	1.99E-02	0.00E+00	5.46E-02
Chromium	1.02E+02	4.18E+00	1.01E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	5.70E-01	2.78E-01	3.21E-02	8.81E-01
Lead	9.89E+01	3.49E+00	3.40E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	4.76E-01	2.70E-01	1.08E-03	7.46E-01
Manganese	5.47E+02	4.32E+01	1.94E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	5.89E+00	1.49E+00	6.17E-02	7.45E+00
Mercury	5.20E-01	1.95E-02	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	2.66E-03	1.42E-03	0.00E+00	4.08E-03
Nickel	1.89E+02	5.46E+00	1.92E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	7.45E-01	5.15E-01	6.11E-03	1.27E+00
Selenium	5.50E-01	2.63E-01	4.40E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	3.58E-02	1.50E-03	1.40E-03	3.87E-02
Vanadium	1.81E+03	8.78E+00	4.13E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	L20E+00	4.94E+00	L31E-01	6.26E+00
Zinc	4.76E+02	1.47E+02	2.87E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	2.00E+01	1.30E+00	9.13E-02	2.14E+01
Hudson Branch Wetland													
Antimony	7.00E+00	2.45E-01	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	3.34E-02	1.91E-02	0.00E+00	5.25E-02
Barium	7.39E+02	1.15E+02	1.19E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	1.57E+01	2.02E+00	3.79E-02	1.78E+01
Beryllium	6.01E+01	1.19E+01	2.60E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	1.62E+00	1.64E-01	8.27E-04	1.78E+00
Cadmium	5.30E+00	1.55E+00	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	2.11E-01	1.45E-02	0.00E+00	2.25E-01
Chromium	8.94E+03	3.67E+02	1.01E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	5.00E+01	2.44E+01	3.21E-02	7.44E+01
Cobalt	8.71E+01	6.53E-01	1.01E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	8.91E-02	2.38E-01	3.21E-03	3.30E-01
Copper	8.87E+02	2.83E+01	2.32E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	3.86E+00	2.42E+00	7.38E-03	6.28E+00
Lead	7.60E+02	1.09E+01	3.40E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	1.49E+00	2.07E+00	1.08E-03	3.57E+00

Table 4-12
White-Footed Mouse - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Terrestrial Vegetation Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Manganese	1.68E+03	1.33E+02	1.94E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	1.81E+01	4.58E+00	6.17E-02	2.27E+01
Mercury	5.20E-01	1.95E-02	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	2.66E-03	1.42E-03	0.00E+00	4.08E-03
Nickel	3.36E+03	4.70E+01	1.92E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	6.41E+00	9.16E+00	6.11E-03	1.56E+01
Selenium	6.20E-01	3.00E-01	4.40E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	4.09E-02	1.69E-03	1.40E-03	4.40E-02
Vanadium	1.21E+04	5.87E+01	4.13E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	8.00E+00	3.30E+01	1.31E-01	4.11E+01
Zinc	1.31E+03	2.58E+02	2.87E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	3.51E+01	3.57E+00	9.13E-02	3.88E+01

Notes:

[1] Maximum surface soil concentrations from Table 2-4.

[2] Maximum terrestrial vegetation concentrations from Table 4-3.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum vegetation, surface soil and surface water exposure doses.

Table 4-13
American Robin - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg)[1]	Maximum Terrestrial Invertebrate Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/l.)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (l./day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Antimony	6.50E+00	6.50E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	7.94E-01	1.69E-02	0.00E+00	8.10E-01
Chromium	5.14E+01	1.57E+01	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	1.92E+00	1.34E-01	1.44E-02	2.07E+00
Copper	9.13E+01	4.70E+01	2.32E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	5.74E+00	2.37E-01	3.31E-03	5.98E+00
Lead	1.47E+01	7.04E+00	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	8.59E-01	3.82E-02	4.86E-04	8.98E-01
Manganese	4.08E+02	2.69E+01	1.94E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.28E+00	1.06E+00	2.77E-02	4.37E+00
Nickel	1.79E+02	5.91E-01	1.92E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	7.21E-02	4.65E-01	2.74E-03	5.40E-01
Vanadium	6.71E+02	2.82E+01	4.13E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.44E+00	1.74E+00	5.90E-02	5.24E+00
Zinc	4.89E+01	3.06E+02	2.87E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.74E+01	1.27E-01	4.10E-02	3.76E+01
Eastern Storage Areas													
Aroclor 1248	1.90E+00	9.81E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	1.20E+00	4.94E-03	0.00E+00	1.20E+00
Aroclor 1254	1.50E+00	7.11E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	8.68E-01	3.90E-03	0.00E+00	8.72E-01
Antimony	1.38E+01	1.38E+01	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	1.68E+00	3.58E-02	0.00E+00	1.72E+00
Barium	6.83E+02	6.22E+01	1.19E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	7.59E+00	1.77E+00	1.70E-02	9.38E+00
Beryllium	3.55E+01	1.60E+00	2.60E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	1.95E-01	9.22E-02	3.71E-04	2.88E-01
Cadmium	2.80E+00	1.88E+01	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	2.29E+00	7.27E-03	0.00E+00	2.30E+00
Chromium	1.10E+03	3.37E+02	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	4.11E+01	2.86E+00	1.44E-02	4.40E+01
Cobalt	1.90E+01	2.32E+00	1.01E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	2.83E-01	4.94E-02	1.44E-03	3.34E-01
Copper	3.42E+02	1.76E+02	2.32E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	2.15E+01	8.88E-01	3.31E-03	2.24E+01
Lead	3.31E+02	8.69E+01	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	1.06E+01	8.60E-01	4.86E-04	1.15E+01
Manganese	3.15E+03	1.08E+02	1.94E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	1.32E+01	8.18E+00	2.77E-02	2.14E+01
Nickel	1.11E+03	3.66E+00	1.92E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	4.47E-01	2.88E+00	2.74E-03	3.33E+00
Vanadium	4.88E+03	2.05E+02	4.13E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	2.50E+01	1.27E+01	5.90E-02	3.77E+01
Zinc	3.35E+02	5.76E+02	2.87E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	7.03E+01	8.70E-01	4.10E-02	7.12E+01
Southern Area													
Antimony	7.30E+00	7.30E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	8.91E-01	1.90E-02	0.00E+00	9.10E-01
Chromium	1.02E+02	3.12E+01	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.81E+00	2.65E-01	1.44E-02	4.09E+00
Lead	9.89E+01	3.28E+01	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	4.00E+00	2.57E-01	4.86E-04	4.26E+00
Manganese	5.47E+02	3.28E+01	1.94E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	4.00E+00	1.42E+00	2.77E-02	5.45E+00
Mercury	5.20E-01	3.48E-03	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	4.25E-04	1.35E-03	0.00E+00	1.78E-03
Nickel	1.89E+02	6.24E-01	1.92E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	7.61E-02	4.91E-01	2.74E-03	5.70E-01
Selenium	5.50E-01	5.99E-01	4.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	7.31E-02	1.43E-03	6.29E-04	7.51E-02
Vanadium	1.81E+03	7.60E+01	4.13E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	9.28E+00	4.70E+00	5.90E-02	1.40E+01
Zinc	4.76E+02	6.46E+02	2.87E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	7.89E+01	1.24E+00	4.10E-02	8.02E+01
Hudson Brahch Wetland													
Antimony	7.00E+00	7.00E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	8.55E-01	1.82E-02	0.00E+00	8.73E-01
Barium	7.39E+02	6.72E+01	1.19E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	8.21E+00	1.92E+00	1.70E-02	1.01E+01
Beryllium	6.01E+01	2.70E+00	2.60E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	3.30E-01	1.56E-01	3.71E-04	4.87E-01
Cadmium	5.30E+00	3.12E+01	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	3.81E+00	1.38E-02	0.00E+00	3.82E+00
Chromium	8.94E+03	2.74E+03	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.34E+02	2.32E+01	1.44E-02	3.57E+02
Cobalt	8.71E+01	1.06E+01	1.01E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	1.30E+00	2.26E-01	1.44E-03	1.52E+00
Copper	8.87E+02	4.57E+02	2.32E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	5.58E+01	2.30E+00	3.31E-03	5.81E+01

Table 4-13
American Robin - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg)[1]	Maximum Terrestrial Invertebrate Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Lead	7.60E+02	1.70E+02	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	2.07E+01	1.97E+00	4.86E-04	2.27E+01
Manganese	1.68E+03	7.05E+01	1.94E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	8.61E+00	4.36E+00	2.77E-02	1.30E+01
Mercury	5.20E-01	3.48E-03	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	4.25E-04	1.35E-03	0.00E+00	1.78E-03
Nickel	3.36E+03	1.11E+01	1.92E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	1.35E+00	8.73E+00	2.74E-03	1.01E+01
Selenium	6.20E-01	6.54E-01	4.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	7.98E-02	1.61E-03	6.29E-04	8.20E-02
Vanadium	1.21E+04	5.08E+02	4.13E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	6.20E+01	3.14E+01	5.90E-02	9.35E+01
Zinc	1.31E+03	9.01E+02	2.87E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	1.10E+02	3.40E+00	4.10E-02	1.13E+02

Notes:

[1] Maximum surface soil concentrations from Table 2-4.

[2] Maximum terrestrial invertebrate concentrations from Table 4-5.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum invertebrate, surface soil and surface water exposure doses.

Table 4-14
Short-Tailed Shrew - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg)[1]	Maximum Terrestrial Invertebrate Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Antimony	6.50E+00	6.50E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	8.67E-01	1.30E-01	0.00E+00	9.97E-01
Chromium	5.14E+01	1.57E+01	1.01E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	2.10E+00	1.03E+00	2.02E-02	3.15E+00
Copper	9.13E+01	4.70E+01	2.32E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	6.27E+00	1.83E+00	4.64E-03	8.10E+00
Lead	1.47E+01	7.04E+00	3.40E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	9.38E-01	2.94E-01	6.80E-04	1.23E+00
Manganese	4.08E+02	2.69E+01	1.94E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	3.58E+00	8.16E+00	3.88E-02	1.18E+01
Nickel	1.79E+02	5.91E-01	1.92E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	7.88E-02	3.58E+00	3.84E-03	3.66E+00
Vanadium	6.71E+02	2.82E+01	4.13E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	3.76E+00	1.34E+01	8.26E-02	1.73E+01
Zinc	4.89E+01	3.06E+02	2.87E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	4.09E+01	9.78E-01	5.74E-02	4.19E+01
Eastern Storage Areas													
Aroclor 1248	1.90E+00	9.81E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.31E+00	3.80E-02	0.00E+00	1.35E+00
Aroclor 1254	1.50E+00	7.11E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	9.48E-01	3.00E-02	0.00E+00	9.78E-01
Antimony	1.38E+01	1.38E+01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.84E+00	2.76E-01	0.00E+00	2.12E+00
Barium	6.83E+02	6.22E+01	1.19E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	8.29E+00	1.37E+01	2.38E-02	2.20E+01
Beryllium	3.55E+01	1.60E+00	2.60E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	2.13E-01	7.10E-01	5.20E-04	9.24E-01
Cadmium	2.80E+00	1.88E+01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	2.50E+00	5.60E-02	0.00E+00	2.56E+00
Chromium	1.10E+03	3.37E+02	1.01E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	4.49E+01	2.20E+01	2.02E-02	6.69E+01
Cobalt	1.90E+01	2.32E+00	1.01E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	3.09E-01	3.80E-01	2.02E-03	6.91E-01
Copper	3.42E+02	1.76E+02	2.32E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	2.35E+01	6.84E+00	4.64E-03	3.03E+01
Lead	3.31E+02	8.69E+01	3.40E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	1.16E+01	6.62E+00	6.80E-04	1.82E+01
Manganese	3.15E+03	1.08E+02	1.94E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	1.44E+01	6.30E+01	3.88E-02	7.75E+01
Nickel	1.11E+03	3.66E+00	1.92E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	4.88E-01	2.22E+01	3.84E-03	2.27E+01
Vanadium	4.88E+03	2.05E+02	4.13E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	2.73E+01	9.75E+01	8.26E-02	1.25E+02
Zinc	3.35E+02	5.76E+02	2.87E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	7.68E+01	6.70E+00	5.74E-02	8.36E+01
Southern Area													
Antimony	7.30E+00	7.30E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	9.73E-01	1.46E-01	0.00E+00	1.12E+00
Chromium	1.02E+02	3.12E+01	1.01E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	4.16E+00	2.04E+00	2.02E-02	6.22E+00
Lead	9.89E+01	3.28E+01	3.40E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	4.37E+00	1.98E+00	6.80E-04	6.35E+00
Manganese	5.47E+02	3.28E+01	1.94E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	4.37E+00	1.09E+01	3.88E-02	1.54E+01
Mercury	5.20E-01	3.48E-03	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	4.65E-04	1.04E-02	0.00E+00	1.09E-02
Nickel	1.89E+02	6.24E-01	1.92E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	8.32E-02	3.78E+00	3.84E-03	3.87E+00
Selenium	5.50E-01	5.99E-01	4.40E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	7.98E-02	1.10E-02	8.80E-04	9.17E-02
Vanadium	1.81E+03	7.60E+01	4.13E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	1.01E+01	3.62E+01	8.26E-02	4.64E+01
Zinc	4.76E+02	6.46E+02	2.87E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	8.62E+01	9.52E+00	5.74E-02	9.58E+01
Hudson Branch Wetland													
Antimony	7.00E+00	7.00E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	9.33E-01	1.40E-01	0.00E+00	1.07E+00
Barium	7.39E+02	6.72E+01	1.19E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	8.97E+00	1.48E+01	2.38E-02	2.38E+01
Beryllium	6.01E+01	2.70E+00	2.60E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	3.61E-01	1.20E+00	5.20E-04	1.56E+00
Cadmium	5.30E+00	3.12E+01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	4.16E+00	1.06E-01	0.00E+00	4.26E+00
Chromium	8.94E+03	2.74E+03	1.01E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	3.65E+02	1.79E+02	2.02E-02	5.44E+02
Cobalt	8.71E+01	1.06E+01	1.01E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	1.42E+00	1.74E+00	2.02E-03	3.16E+00
Copper	8.87E+02	4.57E+02	2.32E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	6.09E+01	1.77E+01	4.64E-03	7.87E+01

Table 4-14
Short-Tailed Shrew - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Terrestrial Invertebrate Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Lead	7.60E+02	1.70E+02	3.40E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	2.27E+01	1.52E+01	6.80E-04	3.79E+01
Manganese	1.68E+03	7.05E+01	1.94E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	9.40E+00	3.36E+01	3.88E-02	4.30E+01
Mercury	5.20E-01	3.48E-03	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	4.65E-04	1.04E-02	0.00E+00	1.09E-02
Nickel	3.36E+03	1.11E+01	1.92E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	1.48E+00	6.72E+01	3.84E-03	6.87E+01
Selenium	6.20E-01	6.54E-01	4.40E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	8.71E-02	1.24E-02	8.80E-04	L00E-01
Vanadium	1.21E+04	5.08E+02	4.13E-01	0.0020	0.0003	0.003	0.015	1.00	L00	6.78E+01	2.42E+02	8.26E-02	3.10E+02
Zinc	1.31E+03	9.01E+02	2.87E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	1.20E+02	2.62E+01	5.74E-02	1.46E+02

Notes:

[1] Maximum surface soil concentrations from Table 2-4.

[2] Maximum terrestrial invertebrate concentrations from Table 4-5.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum invertebrate concentratipn * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum invertebrate, surface soil and surface water exposure doses.

Table 4-15
Red-Tailed Hawk - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Small Mammal Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Small Mammal Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Antimony	6.50E+00	3.25E-01	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	2.67E-02	0.00E+00	0.00E+00	2.67E-02
Chromium	5.14E+01	4.18E+00	1.01E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	3.43E-01	0.00E+00	5.89E-03	3.49E-01
Copper	9.13E+01	1.48E+01	2.32E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	1.21E+00	0.00E+00	1.35E-03	1.21E+00
Lead	1.47E+01	3.54E+00	3.40E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	2.90E-01	0.00E+00	1.98E-04	2.91E-01
Manganese	4.08E+02	8.36E+00	1.94E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	6.86E-01	0.00E+00	1.13E-02	6.97E-01
Nickel	1.79E+02	8.76E+00	1.92E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	7.18E-01	0.00E+00	1.12E-03	7.19E-01
Vanadium	6.71E+02	8.25E+00	4.13E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	6.77E-01	0.00E+00	2.41E-02	7.01E-01
Zinc	4.89E+01	1.03E+02	2.87E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	8.47E+00	0.00E+00	1.68E-02	8.49E+00
Eastern Storage Areas													
Aroclor 1248	1.90E+00	8.91E-03	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	7.30E-04	0.00E+00	0.00E+00	7.30E-04
Aroclor 1254	1.50E+00	3.05E-02	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	2.50E-03	0.00E+00	0.00E+00	2.50E-03
Antimony	1.38E+01	6.90E-01	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	5.66E-02	0.00E+00	0.00E+00	5.66E-02
Barium	6.83E+02	4.67E-01	1.19E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	3.83E-02	0.00E+00	6.95E-03	4.52E-02
Berylliuin	3.55E+01	8.00E-02	2.60E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	6.56E-03	0.00E+00	1.52E-04	6.71E-03
Cadmium	2.80E+00	4.63E-01	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	3.79E-02	0.00E+00	0.00E+00	3.79E-02
Chromium	1.10E+03	3.96E+01	1.01E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	3.25E+00	0.00E+00	5.89E-03	3.25E+00
Cobalt	1.90E+01	5.39E-01	1.01E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	4.42E-02	0.00E+00	5.89E-04	4.48E-02
Copper	3.42E+02	1.79E+01	2.32E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	1.47E+00	0.00E+00	1.35E-03	1.47E+00
Lead	3.31E+02	1.40E+01	3.40E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	1.15E+00	0.00E+00	1.98E-04	1.15E+00
Manganese	3.15E+03	6.46E+01	1.94E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	5.30E+00	0.00E+00	1.13E-02	5.31E+00
Nickel	1.11E+03	2.05E+01	1.92E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	1.68E+00	0.00E+00	1.12E-03	1.68E+00
Vanadium	4.88E+03	6.00E+01	4.13E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	4.92E+00	0.00E+00	2.41E-02	4.94E+00
Zinc	3.35E+02	1.18E+02	2.87E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	9.71E+00	0.00E+00	1.68E-02	9.72E+00
Southern Area													
Antimony	7.30E+00	3.65E-01	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	2.99E-02	0.00E+00	0.00E+00	2.99E-02
Chromium	1.02E+02	6.92E+00	1.01E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	5.67E-01	0.00E+00	5.89E-03	5.73E-01
Lead	9.89E+01	8.23E+00	3.40E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	6.75E-01	0.00E+00	1.98E-04	6.75E-01
Manganese	5.47E+02	1.12E+01	1.94E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	9.20E-01	0.00E+00	1.13E-02	9.31E-01
Mercury	5.20E-01	1.04E-02	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	8.53E-04	0.00E+00	0.00E+00	8.53E-04
Nickel	1.89E+02	8.98E+00	1.92E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	7.37E-01	0.00E+00	1.12E-03	7.38E-01
Selenium	5.50E-01	5.27E-01	4.40E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	4.32E-02	0.00E+00	2.57E-04	4.35E-02
Vanadium	1.81E+03	2.23E+01	4.13E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	1.83E+00	0.00E+00	2.41E-02	1.85E+00
Zinc	4.76E+02	1.21E+02	2.87E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	9.95E+00	0.00E+00	1.68E-02	9.97E+00
Hudson Branch Wetland													
Antimony	7.00E+00	3.50E-01	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	2.87E-02	0.00E+00	0.00E+00	2.87E-02
Barium	7.39E+02	5.04E-01	1.19E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	4.13E-02	0.00E+00	6.95E-03	4.83E-02
Beryllium	6.01E+01	1.35E-01	2.60E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	1.11E-02	0.00E+00	1.52E-04	1.12E-02
Cadmium	5.30E+00	6.25E-01	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	5.13E-02	0.00E+00	0.00E+00	5.13E-02
Chromium	8.94E+03	1.84E+02	1.01E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	1.51E+01	0.00E+00	5.89E-03	1.51E+01
Cobalt	8.71E+01	3.94E+00	1.01E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	3.23E-01	0.00E+00	5.89E-04	3.24E-01
Copper	8.87E+02	2.05E+01	2.32E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	1.68E+00	0.00E+00	1.35E-03	1.69E+00

Table 4-1S
Red-Tailed Hawk - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Small Mammal Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Small Mammal Exposure Dose (mg/kg/BW-day)[6]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Lead	7.60E+02	2.03E+01	3.40E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	1.66E+00	0.00E+00	1.98E-04	1.66E+00
Manganese	1.68E+03	3.44E+01	1.94E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	2.82E+00	0.00E+00	1.13E-02	2.84E+00
Mercury	5.20E-01	1.04E-02	0.00E+00	0.0843	0.0000	0.060	1.028	1.00	1.00	8.53E-04	0.00E+00	0.00E+00	8.53E-04
Nickel	3.36E+03	3.43E+01	1.92E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	2.82E+00	0.00E+00	1.12E-03	2.82E+00
Selenium	6.20E-01	5.51E-01	4.40E-03	0.0843	0.0000	0.060	1.028	1.00	1.00	4.52E-02	0.00E+00	2.57E-04	4.55E-02
Vanadium	1.21E+04	1.49E+02	4.13E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	1.22E+01	0.00E+00	2.41E-02	1.22E+01
Zinc	1.31E+03	1.30E+02	2.87E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	1.07E+01	0.00E+00	1.68E-02	1.07E+01

Notes:

[1] Maximum surface soil concentrations from Table 2-4.

[2] Maximum small mammal concentrations from Table 4-6.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum small mammal concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum small mammal, surface soil and surface water exposure doses.

Table 4-16
Red Fox - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg)[1]	Maximum Small Mammal Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Small Mammal Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Antimony	6.50E+00	3.25E-01	0.00E+00	0.1558	0.0044	0.348	4.04	1.00	1.00	1.25E-02	7.08E-03	0.00E+00	1.96E-02
Chromium	5.14E+01	4.18E+00	1.01E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	1.61E-01	5.60E-02	8.70E-03	2.26E-01
Copper	9.13E+01	1.48E+01	2.32E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	5.70E-01	9.94E-02	2.00E-03	6.72E-01
Lead	1.47E+01	3.54E+00	3.40E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	1.37E-01	1.60E-02	2.93E-04	1.53E-01
Manganese	4.08E+02	8.36E+00	1.94E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	3.23E-01	4.44E-01	1.67E-02	7.84E-01
Nickel	1.79E+02	8.76E+00	1.92E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	3.38E-01	1.95E-01	1.65E-03	5.34E-01
Vanadium	6.71E+02	8.25E+00	4.13E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	3.18E-01	7.31E-01	3.56E-02	1.08E+00
Zinc	4.89E+01	1.03E+02	2.87E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	3.98E+00	5.33E-02	2.47E-02	4.06E+00
Eastern Storage Areas													
Aroclor 1248	1.90E+00	8.91E-03	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	3.43E-04	2.07E-03	0.00E+00	2.41E-03
Aroclor 1254	1.50E+00	3.05E-02	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	1.18E-03	1.63E-03	0.00E+00	2.81E-03
Antimony	1.38E+01	6.90E-01	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	2.66E-02	1.50E-02	0.00E+00	4.16E-02
Barium	6.83E+02	4.67E-01	1.19E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	1.80E-02	7.44E-01	1.03E-02	7.72E-01
Beryllium	3.55E+01	8.00E-02	2.60E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	3.09E-03	3.87E-02	2.24E-04	4.20E-02
Cadmium	2.80E+00	4.63E-01	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	1.78E-02	3.05E-03	0.00E+00	2.09E-02
Chromium	1.10E+03	3.96E+01	1.01E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	1.53E+00	1.20E+00	8.70E-03	2.73E+00
Cobalt	1.90E+01	5.39E-01	1.01E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	2.08E-02	2.07E-02	8.70E-04	4.23E-02
Copper	3.42E+02	1.79E+01	2.32E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	6.90E-01	3.72E-01	2.00E-03	1.06E+00
Lead	3.31E+02	1.40E+01	3.40E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	5.41E-01	3.60E-01	2.93E-04	9.02E-01
Manganese	3.15E+03	6.46E+01	1.94E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	2.49E+00	3.43E+00	1.67E-02	5.94E+00
Nickel	1.11E+03	2.05E+01	1.92E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	7.90E-01	1.21E+00	1.65E-03	2.00E+00
Vanadium	4.88E+03	6.00E+01	4.13E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	2.31E+00	5.31E+00	3.56E-02	7.66E+00
Zinc	3.35E+02	1.18E+02	2.87E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	4.56E+00	3.65E-01	2.47E-02	4.95E+00
Southern Area													
Antimony	7.30E+00	3.65E-01	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	1.41E-02	7.95E-03	0.00E+00	2.20E-02
Chromium	1.02E+02	6.92E+00	1.01E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	2.67E-01	1.11E-01	8.70E-03	3.87E-01
Lead	9.89E+01	8.23E+00	3.40E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	3.17E-01	1.08E-01	2.93E-04	4.25E-01
Manganese	5.47E+02	1.12E+01	1.94E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	4.32E-01	5.96E-01	1.67E-02	1.04E+00
Mercury	5.20E-01	1.04E-02	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	4.01E-04	5.66E-04	0.00E+00	9.67E-04
Nickel	1.89E+02	8.98E+00	1.92E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	3.46E-01	2.06E-01	1.65E-03	5.54E-01
Selenium	5.50E-01	5.27E-01	4.40E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	2.03E-02	5.99E-04	3.79E-04	2.13E-02
Vanadium	1.81E+03	2.23E+01	4.13E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	8.59E-01	1.97E+00	3.56E-02	2.87E+00
Zinc	4.76E+02	1.21E+02	2.87E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	4.68E+00	5.18E-01	2.47E-02	5.22E+00
Hudson Branch Wetland													
Antimony	7.00E+00	3.50E-01	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	1.35E-02	7.62E-03	0.00E+00	2.11E-02
Barium	7.39E+02	5.04E-01	1.19E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	1.94E-02	8.05E-01	1.03E-02	8.35E-01
Beryllium	6.01E+01	1.35E-01	2.60E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	5.21E-03	6.55E-02	2.24E-04	7.09E-02
Cadmium	5.30E+00	6.25E-01	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	2.41E-02	5.77E-03	0.00E+00	2.99E-02
Chromium	8.94E+03	1.84E+02	1.01E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	7.11E+00	9.74E+00	8.70E-03	1.69E+01
Cobalt	8.71E+01	3.94E+00	1.01E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	1.52E-01	9.49E-02	8.70E-04	2.48E-01
Copper	8.87E+02	2.05E+01	2.32E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	7.92E-01	9.66E-01	2.00E-03	1.76E+00

Table 4-16
Red Fox - Maximum Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg) [1]	Maximum Small Mammal Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Small Mammal Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Maximum Exposure Dose (mg/kg/BW-day)[8]
Lead	7.60E+02	2.03E+01	3.40E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	7.82E-01	8.28E-01	2.93E-04	1.61E+00
Manganese	1.68E+03	3.44E+01	1.94E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	1.33E+00	1.83E+00	1.67E-02	3.17E+00
Mercury	5.20E-01	1.04E-02	0.00E+00	0.1558	0.0044	0.348	4.040	1.00	1.00	4.01E-04	5.66E-04	0.00E+00	9.67E-04
Nickel	3.36E+03	3.43E+01	1.92E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	1.32E+00	3.66E+00	1.65E-03	4.98E+00
Selenium	6.20E-01	5.51E-01	4.40E-03	0.1558	0.0044	0.348	4.040	1.00	1.00	2.13E-02	6.75E-04	3.79E-04	2.23E-02
Vanadium	1.21E+04	1.49E+02	4.13E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	5.74E+00	1.32E+01	3.56E-02	1.90E+01
Zinc	1.31E+03	1.30E+02	2.87E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	5.03E+00	1.43E+00	2.47E-02	6.48E+00

Notes:

[1] Maximum surface soil concentrations from Table 2-4.

[2] Maximum small mammal concentrations from Table 4-6.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Maximum small mammal concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Maximum surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of maximum small mammal, surface soil and surface water exposure doses.

Table S-1
Aquatic Invertebrate Risk Characterization - Maximum Surface Water Concentrations
SMC Facility
Newfield, New Jersey

Surface Water PCOPEC	Maximum Concentration (ug/L)[1]	Effect Concentration (ug/L)[2]	Species	Endpoint	Hudson Branch TRV HQ[3]
Aluminum	2,310	87	All aquatic organisms	Chronic (CCC) Water Quality Criterion	2.7.E+01
	2,310	89	Hyalella azteca	LC50	2.6.E+01
	2,310	540	Daphnids	Lowest Test EC20	4.E+00
	2,310	750	All aquatic organisms	Acme (CMC) Water Quality Criterion	3.E+00
	2,310	1,900	Daphnids	Lowest Chronic Value for Daphnids	1.E+00
Chromium	101	27.0	All aquatic organisms	Chronic (CCC) Water Quality Criterion	4.E+00
	101	< 44.0	Daphnids	Lowest Chronic Value for Daphnids	2.E+00
	101	565	All aquatic organisms	Acute (CMC) Water Quality Criterion	2.E-01
	101	> 1,000	Hyalella azteca	LC50	LE-01
Copper	23.2	0.21	Daphnids	Lowest Test EC20	1.1.E+02
	23.2	0.23	Daphnids	Lowest Chronic Value for Daphnids	1.0.E+02
	23.2	2.78	All aquatic organisms	Chronic (CCC) Water Quality Criterion	8.E+00
	23.2	3.68	All aquatic organisms	Acute (CMC) Water Quality Criterion	6.E+00
	23.2	6.07	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	4.E+00
	23.2	36.0	Hyalella azteca	LC50	6.E-01
Iron	3,080	16.0	Daphnids	Lowest Test EC20	1.9.E+02
	3,080	158	Daphnids	Lowest Chronic Value for Daphnids	1.9.E+01
	3,080	1,000	All aquatic organisms	Chronic (CCC) Water Quality Criterion	3.E+00
	3,080	1,640	Leptophlebia marginata	NOAEL - Survival (84 days exposure)	2.E+00
	3,080	> 1,000	Hyalella azteca	LC50	3.E+00
	3,080	73,070	Leptophlebia marginata	LC50	4.E-02
Manganese	194	80.3	All aquatic organisms	Tier II - Secondary Chronic Value	2.E+00
	194	> 1,000	Hyalella azteca	LC50	2.E-01
	194	< 1,100	Daphnids	Lowest Chronic Value for Daphnids	2.E-01
	194	< 1,100	Daphnids	Lowest Test EC20	2.E-01
	194	1,470	All aquatic organisms	Tier II - Secondary Acute Value	LE-01
Nickel	19.2	< 5	Daphnids	Lowest Chronic Value for Daphnids	4.E+00
	19.2	15.7	All aquatic organisms	Chronic (CCC) Water Quality Criterion	1.E+00
	19.2	45.0	Daphnids	Lowest Test EC20	4.E-01
	19.2	75.0	Hyalella azteca	LC50	3.E-01
	19.2	128	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	1.E-01
	19.2	142	All aquatic organisms	Acute (CMC) Water Quality Criterion	1.E-01
Vanadium	413	19.1	All aquatic organisms	Tier II - Secondary Chronic Value	2.2.E+01
	413	284	All aquatic organisms	Tier II - Secondary Acute Value	1.E+00
	413	430	Daphnids	Lowest Test EC20	9.6.E-01
	413	> 980	Daphnids	Lowest Chronic Value for Daphnids	4.E-01
	413	1,251	Hyalella azteca	LC50	3.E-01
	413	4,500	Daphnia magna	LC50	9.E-02
Zinc	287	36.1	All aquatic organisms	Chronic (CCC) Water Quality Criterion	8.E+00
	287	36.1	All aquatic organisms	Acute (CMC) Water Quality Criterion	8.E+00
	287	46.7	Daphnids	Lowest Chronic Value for Daphnids	6.E+00
	287	56.0	Hyalella azteca	LC50	5.E+00
	287	> 5,243	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	5.E-02

Notes:
[1] Maximum surface water concentration from Table 2-2.
[2] Surface water TRVs identified in Table 3-1.
[3] HQ (Hazard Quotient) = Maximum concentration / Surface water TRV.

Table 5-2
Aquatic Macroinvertebrate Risk Characterization - Maximum Sediment Concentrations
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Maximum Concentration (mg/kg)[1]	Sediment TRV (mg/kg)[2]	Hudson Branch		
			HQ[3]	# Samples > TRV[4]	# Detect Samples > TRV[5]
VOCs					
Acetone	0.43	22.5	2E-02	0/5 = 0%	0/5 = 0%
Carbon Disulfide	0.004	2.20	2E-03	0/5 = 0%	0/5 = 0%
Methylene Chloride	0.87	26.0	3E-02	0/5 = 0%	0/5 = 0%
SVOCs					
Benzoic Acid	3.20	NA	-	-	-
Bis(2-ethylhexyl)phthalate	0.58	8,900	7.E-05	0/2 = 0%	0/2 = 0%
Phenol	0.52	1.40	4.E-01	0/2 = 0%	0/2 = 0%
Pesticides					
4'4-DDD	0.074	0.0049	1.5E+01	6/6 = 100%	3/3 = 100%
4'4-DDE	0.046	0.0032	1.4E+01	6/6 = 100%	3/3 = 100%
4,4'-DDT	0.051	0.0042	1.2E+01	6/6 = 100%	3/3 = 100%
PCBs					
Total PCBs	1.89	0.059	3.2E+01	5/6 = 83%	4/5 = 80%
(Aroclors 1248, 1254, 1260)					
Inorganics					
Aluminum	32,700	25,500	1.E+00	4/35 = 11%	4/35 = 11%
Antimony	270	3.00	9.0E+01	35/35 = 100%	28/28 = 100%
Arsenic	77.6	9.79	8E+00	23/45 = 51%	23/45 = 51%
Barium	688	NA	-	-	-
Beryllium	22.8	NA	-	-	-
Cadmium	3.90	0.99	4E+00	25/45 = 55%	10/30 = 33%
Chromium	15,700	43.4	3.6E+02	50/50 = 100%	50/50 = 100%
Cobalt	67.3	50.0	1.E+00	1/35 = 3%	1/35 = 3%
Copper	611	31.6	1.9E+01	37/50 = 74%	37/50 = 74%
Iron	43,500	20,000	2.E+00	13/45 = 29%	13/45 = 29%
Lead	437	35.8	1.2E+01	34/45 = 76%	34/45 = 76%
Manganese	1,210	630	2.E+00	10/45 = 22%	10/45 = 22%
Mercury	8.30	0.18	4.6E+01	35/45 = 78%	33/43 = 77%
Nickel	1,090	22.7	4.8E+01	42/50 = 84%	42/50 = 84%
Selenium	7.20	NA	-	-	-
Vanadium	4,870	NA	-	-	-
Zinc	767	121	6.E+00	28/45 = 62%	28/45 = 62%

Notes:
[1] Maximum sediment concentration from Table 2-3.
[2] Sediment TRVs identified in Table 3-2.
[3] HQ (Hazard Quotient) = Maximum concentration / Sediment TRV.
[4] Includes non-detect samples with SQLs greater than sediment TRV.
[5] Excludes non-detect samples with SQLs greater than sediment TRV.

Table 5-3
Semi-Aquatic Wildlife Receptors Maximum Concentration Risk Characterization - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Avian NOAEL TRV (mg/kg-BW/day) [1]	Mammalian NOAEL TRV (mg/kg-BW/day) [2]	Maximum Muskrat Dose (mg/kg/BW-day) [3]	Maximum Mallard Dose (mg/kg/BW-day) [4]	Maximum Little Brown Bat Dose (mg/kg/BW-day) [5]	Maximum Tree Swallow Dose (mg/kg/BW-day) [6]	Maximum Muskrat NOAEL HQ [7]	Maximum Mallard NOAEL HQ [7]	Maximum Little Brown Bat NOAEL HQ [7]	Maximum Tree Swallow NOAEL HQ [7]
SVOCs										
Phenol	NA	120	1.59E-01	1.93E-01	9.82E-02	2.54E-01	1.E-03	-	8.E-04	-
Pesticides										
4,4'-DDD	-	-	7.77E-04	9.25E-04	1.34E-01	3.46E-01	-			
4,4'-DDE	-	-	5.35E-04	6.38E-04	1.95E-02	5.06E-02	-			
4,4'-DDT	-	-	5.80E-04	6.92E-04	9.78E-03	2.53E-02	-			
Total DDT	0.23	0.15	1.89E-03	2.26E-03	1.63E-01	4.22E-01	1.E-02	LE-02	1E+00	2.E+00
PCBs										
Aroclor 1248	0.36	0.50	2.47E-03	2.66E-03	2.86E-01	7.40E-01	5.E-03	7E-03	6.E-01	2E+00
Aroclor 1254	0.36	0.14	4.04E-04	4.25E-04	5.50E-02	1.42E-01	3.E-03	1E-03	4.E-01	4E-01
Aroclor 1260	0.36	0.14	8.53E-04	8.78E-04	1.30E-01	3.36E-01	6.E-03	2E-03	9.E-01	9E-01
Inorganics										
Antimony	NA	0.059	8.23E-01	9.28E-01	5.76E+01	1.49E+02	1.4E+01	-	9.8E+02	-
Arsenic	2.24	1.04	2.81E-01	3.20E-01	2.10E+00	5.44E+00	3.E-01	1E-01	2.E+00	2E+00
Barium	20.8	51.8	7.29E+00	8.68E+00	1.47E+02	3.80E+02	1.E-01	4E-01	3.E+00	1.8E+01
Beryllium	NA	0.53	3.74E-01	4.49E-01	4.86E+00	1.26E+01	7.E-01	-	9.E+00	-
Cadmium	1.47	0.77	8.24E-02	9.92E-02	5.99E-01	1.55E+00	1.E-01	7E-02	8.E-01	1E+00
Chromium	2.66	2.40	6.00E+01	6.87E+01	2.21E+02	5.72E+02	2.5E+01	2.6E+01	9.2E+01	2.2E+02
Cobalt	7.61	7.33	1.25E-01	1.34E-01	1.44E+01	3.72E+01	2.E-02	2E-02	2.E+00	5E+00
Copper	4.05	5.60	2.30E+00	2.63E+00	1.56E+01	4.03E+01	4.E-01	6E-01	3.E+00	1.0E+01
Lead	1.63	4.70	1.09E+00	1.20E+00	6.15E+00	1.59E+01	2.E-01	7E-01	1.E+00	1.E+01
Manganese	179	59.4	7.34E+00	8.59E+00	2.58E+02	6.68E+02	LE-01	5E-02	4.E+00	4E+00
Mercury	0.039	0.250	3.00E-02	3.42E-02	1.91E+00	4.96E+00	LE-01	9E-01	8.E+00	1.3E+02
Nickel	6.71	1.70	2.73E+00	3.02E+00	3.12E+01	8.07E+01	2E+00	5E-01	1.8E+01	1.2E+01
Selenium	0.29	0.14	2.75E-01	3.32E-01	1.54E+00	3.98E+00	2E+00	1E+00	1.1E+01	1.4E+01
Vanadium	0.34	4.16	8.28E+00	8.74E+00	1.04E+03	2.69E+03	2E+00	2.6E+01	2.5E+02	7.9E+03
Zinc	66.1	60.0	1.24E+01	1.48E+01	1.37E+02	3.56E+02	2.E-01	2.E-01	2.E+00	5.E+00
						Total Hazard Index	4.7E+01	5.6E+01	1.4E+03	8.3E+03

Notes:

[1] Avian NOAEL TRVs from Table 3-4 (applies to mallard and tree swallow).

[2] Mammalian NOAEL TRVs from Table 3-5 (applies to muskrat and little brown bat).

[3] Maximum muskrat exposure dose from Tabic 4-7.

[4] Maximum mallard exposure dose from Tabic 4-8.

[5] Maximum little brown bat exposure dose from Table 4-9.

[6] Maximum tree swallow exposure dose from Tabic 4-10.

[7] HQ (Hazard Quotient) = Maximun exposure dose / NOAEL TRV.

Table 5-4
Terrestrial/Wetland Plant Maximum Concentration Risk Characterization - Surface Soils
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg)[1]	Plant TRV[2]	Plant HQ[3]
Former Lagoon Area			
Antimony	6.50	5.0	1E+00
Chromium	51.4	NA	-
Copper	91.3	70	1E+00
Lead	14.7	120	1E-01
Manganese	408	220	2E+00
Nickel	179	38	5E+00
Vanadium	671	100	7E+00
Zinc	49	160	3E-01
Eastern Storage Areas			
Aroclor 1248	1.90	40	5E-02
Aroclor 1254	1.50	40	4E-02
Antimony	14	5.0	3E+00
Barium	683	1,414	5E-01
Beryllium	35.5	56.8	6E-01
Cadmium	2.8	32	9E-02
Chromium	1,100	NA	-
Coball	19.0	13	1E+00
Copper	342	70	5E+00
Lead	331	120	3E+00
Manganese	3,150	220	1.4E+01
Nickel	1,110	38	2.9E+01
Vanadium	4,875	100	4.9E+01
Zinc	335	160	2E+00
Southern Area			
Antimony	7.3	5.0	1E+00
Chromium	102	NA	-
Lead	98.9	120	8E-01
Manganese	547	220	2E+00
Mercury	0.52	0.30	2E+00
Nickel	189	38	5E+00
Selenium	0.55	0.52	1E+00
Vanadium	1,810	100	L8E+01
Zinc	476	160	3E+00
Hudson Branch Wetland			
Antimony	7.0	5.0	1E+00
Barium	739	1,414	5E-01
Beryllium	60.1	56.8	1E+00
Cadmium	5.3	32	2E-01
Chromium	8,940	NA	-
Cobalt	87.1	13	7E+00
Copper	887	70	1.3E+01
Lead	760	120	6E+00
Manganese	1,680	220	8E+00

Table 5-4
Terrestrial/Wetland Plant Maximum Concentration Risk Characterization - Surface Soils
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Maximum Surface Soil Concentration (mg/kg)[1]	Plant TRV[2]	Plant HQ[3]
Mercury	0.52	0.30	2E+00
Nickel	3,360	38	8.8E+01
Selenium	0.62	0.52	1E+00
Vanadium	12,100	100	1.2E+02
Zinc	1,310	160	8E+00

Notes:

[1] Maximum surface soil concentration from Table 2-4

[2] Plant Toxicity Reference Values (TRVs) from Table 3-3.
NA - Not Available

[3] Hazard Quotient (HQ) = Maximum soil concentration / Plant TRV.

Table 5-5
Wildlife Receptors Maximum Concentration Risk Characterization - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Avian NOAEL TRV (mg/kg-BW/day) [1]	Mammalian NOAEL TRV (mg/kg-BW/day) [1]	Maximum Mourning Dove Dose (mg/kg-BW/day) [2]	Maximum White-footed Mouse Dose (mg/kg-BW/day) [3]	Maximum American Robin Dose (mg/kg-BW/day) [5]	Maximum Short-Tailed Shrew Dose (mg/kg-BW/day) [6]	Maximum Red-Tailed Hawk Dose (mg/kg-BW/day) [7]	Maximum Red Fox Dose (mg/kg-BW/day) [8]	Maximum Dove HQ [9]	Maximum Mouse HQ [9]	Maximum Robin HQ [9]	Maximum Shrew HQ [9]	Maximum Hawk HQ [9]	Maximum Fox HQ [9]
Former Lagoon Area														
Antimony	NA	0.059	1.13E-01	4.89E-02	8.10E-01	9.97E-01	2.67E-02	1.96E-02	-	8E-01	-	1.7E+01	-	3E-01
Chromium	2.66	2.40	1.03E+00	4.60E-01	2.07E+00	3.15E+00	3.49E-01	2.26E-01	4E-01	2E-01	8E-01	1E+00	1E-01	9E-02
Copper	4.05	5.60	2.76E+00	1.83E+00	5.98E+00	8.10E+00	1.21E+00	6.72E-01	7E-01	3E-01	1E+00	1E+00	3E-01	1E-01
Lead	1.63	4.70	3.53E-01	2.04E-01	8.98E-01	1.23E+00	2.91E-01	1.53E-01	2E-01	4E-02	6E-01	3E-01	2E-01	3E-02
Manganese	179	59.4	9.75E+00	5.57E+00	4.37E+00	1.18E+01	6.97E-01	7.84E-01	5E-02	9E-02	2E-02	2E-01	4E-03	1E-02
Nickel	6.71	1.70	2.98E+00	1.21E+00	5.40E-01	3.66E+00	7.19E-01	5.34E-01	4E-01	7E-01	8E-02	2E+00	1E-01	3E-01
Vanadium	0.34	4.16	9.25E+00	2.41E+00	5.24E+00	1.73E+01	7.01E-01	1.08E+00	2.7E+01	6E-01	1.5E+01	4E+00	2E+00	3E-01
Zinc	66.1	60.0	6.66E+00	5.91E+00	3.76E+01	4.19E+01	8.49E+00	4.06E+00	1E-01	1E-01	6E-01	7E-01	1E-01	7E-02
								Total Hazard Index	2.9E+01	3E+00	1.9E+01	2.7E+01	3E+00	1E+00
Eastern Storage Areas														
Aroclor 1248	0.36	0.50	2.60E-02	7.37E-03	1.20E+00	1.35E+00	7.30E-04	2.41E-03	7E-02	1E-02	3E+00	1E+00	2E-03	5E-03
Aroclor 1254	0.36	0.14	1.95E-02	4.82E-03	8.72E-01	9.78E-01	2.50E-03	2.81E-03	5E-02	3E-02	2E+00	7E+00	7E-03	2E-02
Antimony	NA	0.059	2.36E-01	1.01E-01	1.72E+00	2.12E+00	5.66E-02	4.16E-02	-	2E+00	-	3.6E+01	-	7E-01
Barium	20.8	51.8	2.34E+01	1.64E+01	9.38E+00	2.20E+01	4.52E-02	7.72E-01	1E+00	3E-01	5E-01	4E-01	2E-03	1E-02
Beryllium	NA	0.53	1.56E+00	1.20E+00	2.88E-01	9.24E-01	6.71E-03	4.20E-02	-	2E+00	-	2E+00	-	8E-02
Cadmium	1.47	0.77	1.86E-01	1.56E-01	2.30E+00	2.56E+00	3.79E-02	2.09E-02	1E-01	2E-01	2E+00	3E+00	3E-02	3E-02
Chromium	2.66	2.40	2.01E+01	9.18E+00	4.40E+01	6.69E+01	3.25E+00	2.73E+00	8E+00	4E+00	1.7E+01	2.8E+01	1E+00	1E+00
Cobalt	7.61	7.33	2.67E-01	7.45E-02	3.34E-01	6.91E-01	4.48E-02	4.23E-02	4E-02	1E-02	4E-02	9E-02	6E-03	6E-03
Copper	4.05	5.60	6.99E+00	3.59E+00	2.24E+01	3.03E+01	1.47E+00	1.06E+00	2E+00	6E-01	6E+00	5E+00	4E-01	2E-01
Lead	1.63	4.70	5.09E+00	1.84E+00	1.15E+01	1.82E+01	1.15E+00	9.02E-01	3E+00	4E-01	7E+00	4E+00	7E-01	2E-01
Manganese	179	59.4	7.40E+01	4.26E+01	2.14E+01	7.75E+01	5.31E+00	5.94E+00	4E-01	7E-01	1E-01	1E+00	3E-02	1E-01
Nickel	6.71	1.70	1.67E+01	5.83E+00	3.33E+00	2.27E+01	1.68E+00	2.00E+00	2E+00	3E+00	5E-01	1.3E+01	3E-01	1E+00
Vanadium	0.34	4.16	6.46E+01	1.67E+01	3.77E+01	1.25E+02	4.94E+00	7.66E+00	1.9E+02	4E+00	1.1E+02	3.0E+01	1.5E+01	2E+00
Zinc	66.1	60.0	2.12E+01	1.75E+01	7.12E+01	8.36E+01	9.72E+00	4.95E+00	3E-01	3E-01	1E+00	1E+00	1E-01	8E-02
								Total Hazard Index	2.1E+02	1.8E+01	1.5E+02	1.3E+02	1.7E+01	6E+00
Southern Area														
Antimony	NA	0.059	1.26E-01	5.46E-02	9.10E-01	1.12E+00	2.99E-02	2.20E-02	-	9E-01	-	1.9E+01	-	4E-01
Chromium	2.66	2.40	1.95E+00	8.81E-01	4.09E+00	6.22E+00	5.73E-01	3.87E-01	7E-01	4E-01	2E+00	3E+00	2E-01	2E-01
Lead	1.63	4.70	1.72E+00	7.46E-01	4.26E+00	6.35E+00	6.75E-01	4.25E-01	1E+00	2E-01	3E+00	1E+00	4E-01	9E-02
Manganese	179	59.4	1.30E+01	7.45E+00	5.45E+00	1.54E+01	9.31E-01	1.04E+00	7E-02	1E-01	3E-02	3E-01	5E-03	2E-02
Mercury	0.039	0.250	9.20E-03	4.08E-03	1.78E-03	1.09E-02	8.53E-04	9.67E-04	2E-01	2E-02	5E-02	4E-02	2E-02	4E-03
Nickel	6.71	1.70	3.14E+00	1.27E+00	5.70E-01	3.87E+00	7.38E-01	5.54E-01	5E-01	7E-01	8E-02	2E+00	1E-01	3E-01
Selenium	0.29	0.14	4.76E-02	3.87E-02	7.51E-02	9.17E-02	4.35E-02	2.13E-02	2E-01	3E-01	3E-01	7E-01	1E-01	2E-01
Vanadium	0.34	4.16	2.42E+01	6.26E+00	1.40E+01	4.64E+01	1.85E+00	2.87E+00	7.1E+01	2E+00	4.1E+01	1.1E+01	5E+00	7E-01
Zinc	66.1	60.0	2.66E+01	2.14E+01	8.02E+01	9.58E+01	9.97E+00	5.22E+00	4E-01	4E-01	1E+00	2E+00	2E-01	9E-02
								Total Hazard Index	7.4E+01	4E+00	4.7E+01	3.9E+01	7E+00	2E+00
Hudson Branch Wetland														
Antimony	NA	0.059	1.21E-01	5.25E-02	8.73E-01	1.07E+00	2.87E-02	2.11E-02	-	9E-01	-	1.8E+01	-	4E-01
Barium	20.8	51.8	2.53E+01	1.78E+01	1.01E+01	2.38E+01	4.83E-02	8.35E-01	1E+00	3E-01	5E-01	5E-01	2E-03	2E-02
Beryllium	NA	0.53	2.39E+00	1.78E+00	4.87E-01	1.56E+00	1.12E-02	7.09E-02	-	3E+00	-	3E+00	-	1E-01
Cadmium	1.47	0.77	2.80E-01	2.25E-01	3.82E+00	4.26E+00	5.13E-02	2.99E-02	2E-01	3E-01	3E+00	6E+00	3E-02	4E-02

Table 5-5

Wildlife Receptors Maximum Concentration Risk Characterization - Terrestrial/Wetland Habitats

SMC Facility

Newfield, New Jersey

Surface Soil PCOPECs	Avian NOAEL TRV (mg/kg-BW/day) [1]	Mammalian NOAEL TRV (mg/kg-BW/day) [2]	Maximum Mourning Dove Dose (mg/kg-BW/day)[3]	Maximum White-footed Mouse Dose (mg/kg-BW/day)[4]	Maximum American Robin Dose (mg/kg-BW/day)[5]	Maximum Short-Tailed Shrew Dose (mg/kg-BW/day)[6]	Maximum Red-Tailed Hawk Dose (mg/kg-BW/day)[7]	Maximum Red Fox Dose (mg/kg-BW/day)[8]	Maximum Dove HQ[9]	Maximum Mouse HQ[9]	Maximum Robin HQ[9]	Maximum Shrew HQ[9]	Maximum Hawk HQ[9]	Maximum Fox HQ[9]
Chromium	2.66	2.40	1.63E+02	7.44E+01	3.57E+02	5.44E+02	1.51E+01	1.69E+01	6.1E+01	3.1E+01	1.3E+02	2.3E+02	6E+00	7E+00
Cobalt	7.61	7.33	1.19E+00	3.30E-01	1.52E+00	3.16E+00	3.24E-01	2.48E-01	2E-01	4E-02	2E-01	4E-01	4E-02	3E-02
Copper	4.05	5.60	1.50E+01	6.28E+00	5.81E+01	7.87E+01	1.69E+00	1.76E+00	4E+00	1E+00	1.4E+01	1.4E+01	4E-01	3E-01
Lead	1.63	4.70	1.10E+01	3.57E+00	2.27E+01	3.79E+01	1.66E+00	1.61E+00	7E+00	8E-01	1.4E+01	8E+00	1E+00	3E-01
Manganese	179	59.4	3.96E+01	2.27E+01	1.30E+01	4.30E+01	2.84E+00	3.17E+00	2E-01	4E-01	7E-02	7E-01	2E-02	5E-02
Mercury	0.039	0.250	9.20E-03	4.08E-03	1.78E-03	1.09E-02	8.53E-04	9.67E-04	2E-01	2E-02	5E-02	4E-02	2E-02	4E-03
Nickel	6.71	1.70	4.85E+01	1.56E+01	1.01E+01	6.87E+01	2.82E+00	4.98E+00	7E+00	9E+00	2E+00	4.0E+01	4E-01	3E+00
Selenium	0.29	0.14	5.36E-02	4.40E-02	8.20E-02	1.00E-01	4.55E-02	2.23E-02	2E-01	3E-01	3E-01	7E-01	2E-01	2E-01
Vanadium	0.34	4.16	1.60E+02	4.11E+01	9.35E+01	3.10E+02	1.22E+01	1.90E+01	4.7L+02	1E+01	2.8E+02	7.4E+01	3.6E+01	5E+00
Zinc	66.1	60.0	5.23E+01	3.88E+01	1.13E+02	1.46E+02	1.07E+01	6.48E+00	8E-01	6E-01	2E+00	2E+00	2E-01	1E-01
							Total Hazard Index		5.5E+02	5.5E+01	4.4E+02	3.9E+02	4.4E+01	1.6E+01

Notes:

[1] Avian NOAEL TRVs from Table 3-4 (applies to mourning dove, American robin and red-tailed hawk).

[2] Mammalian NOAEL TRVs from Table 3-5 (applies to white-footed mouse, short-tailed shrew and red fox).

[3] Maximum mourning dove exposure dose from Table 4-11.

[4] Maximum white-footed mouse exposure dose from Table 4-12.

[5] Maximum American robin exposure dose from Table 4-13.

[6] Maximum short-tailed shrew exposure dose from Table 4-14.

[7] Maximum red-tailed hawk exposure dose from Table 4-15.

[8] Maximum red fox exposure dose from Table 4-16.

[9] HQ (Hazard Quotient) = Maximum exposure dose / NOAEL TRV.

Table 6-1
Aquatic Invertebrate Risk Characterization - Mean Surface Water Concentrations
SMC Facility
Newfield, New Jersey

Surface Water PCOPEC	Mean Concentration (ug/L)[1]	Effect Concentration (ug/L)[2]	Species	Endpoint	Hudson Branch	
					HQ[3]	# Samples > TRV
Aluminum	949	87	All aquatic organisms	Chronic (CCC) Water Quality Criterion	1.1E+01	5/5 = 100%
	949	89	Hyalella azteca	LC50	1.1E+01	5/5 = 100%
	949	540	Daphnids	Lowest Test EC20	2.E+00	3/5 = 60%
	949	750	All aquatic organisms	Acute (CMC) Water Quality Criterion	1.E+00	3/5 = 60%
	949	1,900	Daphnids	Lowest Chronic Value for Daphnids	5.E-01	1/5 = 20%
Chromium	48.3	27.0	All aquatic organisms	Chronic (CCC) Water Quality Criterion	2.E+00	4/5 = 80%
	48.3	< 44.0	Daphnids	Lowest Chronic Value for Daphnids	1.E+00	2/5 = 40%
	48.3	565	All aquatic organisms	Acute (CMC) Water Quality Criterion	9.E-02	0/5 = 0%
	48.3	> 1,000	Hyalella azteca	LC50	5.E-02	0/5 = 0%
Copper	11.8	0.21	Daphnids	Lowest Test EC20	5.8E+01	5/5 = 100%
	11.8	0.23	Daphnids	Lowest Chronic Value for Daphnids	5.1E+01	5/5 = 100%
	11.8	2.78	All aquatic organisms	Chronic (CCC) Water Quality Criterion	4.E+00	5/5 = 100%
	11.8	3.68	All aquatic organisms	Acute (CMC) Water Quality Criterion	3.E+00	5/5 = 100%
	11.8	6.07	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	2.E+00	4/5 = 80%
	11.8	36.0	Hyalella azteca	LC50	3.E-01	0/5 = 0%
Iron	1,037	16.0	Daphnids	Lowest Test EC20	6.5.E+01	5/5 = 100%
	1,037	158	Daphnids	Lowest Chronic Value for Daphnids	6.6.E+00	4/5 = 80%
	1,037	1,000	All aquatic organisms	Chronic (CCC) Water Quality Criterion	1.E+00	1/5 = 20%
	1,037	1,640	Leptophlebia marginata	NQAEL - Survival (84 days exposure)	6.E-01	1/5 = 20%
	1,037	> 1,000	Hyalella azteca	LC50	-	-
	1,037	73,070	Leptophlebia marginata	LC50	1.E-02	0/5 = 0%
Manganese	73.8	80.3	All aquatic organisms	Tier II - Secondary Chronic Value	9.E-01	2/5 = 40%
	73.8	> 1,000	Hyalella azteca	LC50	7.E-02	0/5 = 0%
	73.8	< 1,100	Daphnids	Lowest Chronic Value for Daphnids	7.E-02	0/5 = 0%
	73.8	< 1,100	Daphnids	Lowest Test EC20	7.E-02	0/5 = 0%
	73.8	1,470	All aquatic organisms	Tier II - Secondary Acute Value	5.E-02	0/5 = 0%
Nickel	10.8	< 5	Daphnids	Lowest Chronic Value for Daphnids	2.E+00	5/5 = 100%
	10.8	15.7	All aquatic organisms	Chronic (CCC) Water Quality Criterion	7.E-01	1/5 = 20%
	10.8	45.0	Daphnids	Lowest Test EC20	2.E-01	0/5 = 0%
	10.8	75.0	Hyalella azteca	LC50	1.E-01	0/5 = 0%
	10.8	128	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	8.E-02	0/5 = 0%
	10.8	142	All aquatic organisms	Acute (CMC) Water Quality Criterion	8.E-02	0/5 = 0%
Vanadium	183	19.1	All aquatic organisms	Tier II - Secondary Chronic Value	1E+01	5/5 = 100%
	183	284	All aquatic organisms	Tier II - Secondary Acute Value	6.E-01	1/5 = 20%
	183	430	Daphnids	Lowest Test EC20	4E-01	0/5 = 0%
	183	> 980	Daphnids	Lowest Chronic Value for Daphnids	2.E-01	0/5 = 0%
	183	1,251	Hyalella azteca	LC50	1.E-01	0/5 = 0%
	183	4,500	Daphnia magna	LC50	4.E-02	0/5 = 0%
Zinc	93.7	36.1	All aquatic organisms	Chronic (CCC) Water Quality Criterion	3.E+00	4/5 = 80%
	93.7	36.1	All aquatic organisms	Acute (CMC) Water Quality Criterion	3.E+00	4/5 = 80%
	93.7	46.7	Daphnids	Lowest Chronic Value for Daphnids	2.E+00	4/5 = 80%
	93.7	56.0	Hyalella azteca	LC50	2.E+00	1/5 = 20%
	93.7	> 5,243	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	2.E-02	0/5 = 0%

Notes:

[1] Mean surface water concentration from Table B-1.

[2] Surface water TRVs identified in Table 3-1.

[3] HQ (Hazard Quotient) = Mean concentration / Surface water TRV.

[4] Includes non-detect results with Sample Quantification Limits greater than surface water TRV.

Table 6-2
Aquatic Macroinvertebrate Risk Characterization - Sediment Concentrations
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Maximum Concentration (mg/kg)[1]	Sediment PEC/SEL TRV (mg/kg)[2]	Hudson Branch	
			HQ[3]	# Samples > TRV[4]
SVOCs				
Benzoic Acid	3.20	NA	-	-
Pesticides				
4'4-DDD	0.074	0.60	1E-01	0/6 = 0%
4'4-DDE	0.046	1.90	2E-02	0/6 = 0%
4,4'-DDT	0.051	7.10	7E-03	0/6 = 0%
PCBs				
Total PCBs	1.89	53.0	4E-02	0/6 = 0%
(Aroclors 1248, 1254, 1260)				
Inorganics				
Antimony	270	NA	-	-
Arsenic	77.6	33.0	2E+00	2/45 = 4%
Barium	688	NA	-	-
Beryllium	22.8	NA	-	-
Cadmium	3.90	4.98	8E-01	0/30 = 0%
Chromium	15,700	111	1.4E+02	47/50 = 94%
Copper	611	149	4E+00	18/50 = 36%
Iron	43,500	40,000	1E+00	3/45 = 7%
Lead	437	128	3E+00	21/45 = 47%
Manganese	1,210	1,100	1E+00	3/45 = 7%
Mercury	8.30	1.06	8E+00	16/43 = 37%
Nickel	1,090	48.6	2.2E+01	38/50 = 76%
Selenium	7.20	NA	-	-
Vanadium	4,870	NA	-	-
Zinc	767	459	2E+00	7/45 = 16%

Notes:

[1] Maximum sediment concentration from Table 2-3.

[2] Sediment TRVs identified in Table 3-2.

[3] HQ (Hazard Quotient) = Maximum concentration / Sediinent TRV.

[4] Number of the total samples witb detected values greater than sediment TRV.

Table 6-3
Mean and Mean UCL Estimated Aquatic Plant Tissue PCOPEC Concentrations - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPECs	Mean Sediment Concentration (mg/kg) [1]	Mean UCL Sediment Concentration (mg/kg) [1]	Plant Uptake Factor[2]	Mean Plant Concentration (mg/kg) [3]	Mean UCL Plant Concentration (mg/kg) [3]
Inorganics					
Antimony	57.0	75.1	ln(P)= 0.938*ln(soil) - 3.233 [4]	1.75E+00	2.27E+00
Chromium	3,545	4,634	0.0410	1.45E+02	1.90E+02
Nickel	215	288	ln(P)= 0.748*ln(soil) - 2.223 [4]	6.02E+00	7.48E+00
Selenium	1.74	2.09	ln(P)= 1.104*ln(soil) - 0.677 [4]	9.37E-01	1.15E+00
Vanadium	1,438	1,983	0.0049	6.97E+00	9.62E+00

Notes:

[1] Mean and mean UCL sediment concentrations from Hudson Branch (see Table B-3)

[2] Plant uptake factor sources presented in Table 4-2.

[3] Plant foliage concentrations presented on dry weight basis

[4] Regression equation cited in source used to calculate plant concentration based on maximum sediment concentration.

Example Calculation - Nickel Concentration

$\ln(P) = 0.748*\ln(soil) - 2.223$

$\ln(P) = (0.748 * 288) - 2.223$

$\ln(P) = 4.236 - 2.223$

$P = 7.48$ mg/kg

Table 6-4
Mean and Mean UCL Estimated Aquatic Invertebrate PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Sediment PCOPECs	Mean Sediment Concentration (mg/kg) [1]	Mean UCL Sediment Concentration (mg/kg) [1]	Mean TOC Normalized Sediment Concentration (mg/kg) [2]	Mean UCL TOC Normalized Sediment Concentration (mg/kg) [2]	Aquatic Invertebrate BSAF [3]	Aquatic Invertebrate Lipid Content (fraction) [4]	Mean Aquatic Invertebrate Concentration (mg/kg) [5]	Mean UCL Aquatic Invertebrate Concentration (mg/kg) [5]
Pesticides								
4,4'-DDD	0.029	0.074	0.290	0.739	9.558	0.031	2.45E-01	6.26E-01
4,4'-DDE	0.025	0.046	0.250	0.460	2.248	0.031	4.97E-02	9.15E-02
4,4'-DDT	0.031	0.051	0.310	0.510	1.016	0.031	2.79E-02	4.59E-02
PCB Aroclors								
Aroclor 1248	0.36	1.30	3.55	12.99	0.551	0.066	3.66E-01	1.34E+00
Inorganics								
Antimony [6]	57.0	75.1	-	-	1.00	-	5.70E+01	7.51E+01
Arsenic	13.2	17.4	-	-	0.127	-	1.68E+00	2.21E+00
Barium [6]	262	309	-	-	1.00	-	2.62E+02	3.09E+02
Beryllium [6]	7.13	9.81	-	-	1.00	-	7.13E+00	9.81E+00
Chromium	3,545	4,634	-	-	0.066	-	2.34E+02	3.06E+02
Cobalt [6]	19.9	26.0	-	-	1.00	-	1.99E+01	2.60E+01
Copper	131	173	-	-	log(I)=0.278*log(S)+1.089	-	4.76E+01	5.14E+01
Lead	135	175	-	-	0.066	-	8.94E+00	1.16E+01
Manganese	391	487	-	-	1.00	-	3.91E+02	4.87E+02
Mercury	0.94	1.35	-	-	1.081	-	1.02E+00	1.46E+00
Nickel	215	288	-	-	0.134	-	2.89E+01	3.85E+01
Selenium [6]	1.74	2.09	-	-	1.00	-	1.74E+00	2.09E+00
Vanadium [6]	1,438	1,983	-	-	1.00	-	1.44E+03	1.98E+03
Zinc	228	296	-	-	0.84	-	1.91E+02	2.49E+02

Notes:

[1] Mean and mean UCL sediment concentrations (dry weight) from Table B-3.

[2] Mean and mean UCL sediment concentration (dry weight) divided by mean TOC (dry weight) of sediment (10.008%).

[3] Aquatic invertebrate BSAF sources presented in Table 4-4.

[4] BSAF database - Mean lipid content of crayfish or freshwater emerging insects .

[5] TOC normalized sediment concentration * aquatic invertebrate BSAF * aquatic invertebrate lipid concent (dry weight).

[6] BSAF not available from USEPA (2007h). Assumed BSAF of 1.00.

Tabic 6-S
Muskrat - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Mean Sediment Concentration (mg/kg) [1]	Mean Aquatic Vegetation Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Sediment Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]	Sediment Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]
Inorganics													
Antimony	5.70E+01	1.75E+00	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	1.03E-01	8.02E-02	0.00E+00	1.83E-01
Chromium	3.55E+03	1.45E+02	1.01E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	8.55E+00	4.99E+00	9.73E-03	1.35E+01
Nickel	2.15E+02	6.02E+00	1.92E-02	0.0794	0.0019	0.130	1.35	1.00	1.00	3.54E-01	3.03E-01	1.85E-03	6.59E-01
Selenium	1.74E+00	9.37E-01	4.40E-03	0.0794	0.0019	0.130	1.35	1.00	1.00	5.51E-02	2.45E-03	4.24E-04	5.80E-02
Vanadium	1.44E+03	6.97E+00	4.13E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	4.10E-01	2.02E+00	3.98E-02	2.47E+00
Sediment PCOPEC	Mean UCL Sediment Concentration (mg/kg) [1]	Mean UCL Aquatic Vegetation Concentration (mg/kg)[2]	Maximum Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Sediment Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]	Sediment Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW day)[8]
Inorganics													
Antimony	7.51E+01	2.27E+00	0.00E+00	0.0794	0.0019	0.130	1.35	1.00	1.00	1.33E-01	1.06E-01	0.00E+00	2.39E-01
Chromium	4.63E+03	1.90E+02	1.01E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	1.12E+01	6.52E+00	9.73E-03	1.77E+01
Nickel	2.88E+02	7.48E+00	1.92E-02	0.0794	0.0019	0.130	1.35	1.00	1.00	4.40E-01	4.05E-01	1.85E-03	8.46E-01
Selenium	2.09E+00	1.15E+00	4.40E-03	0.0794	0.0019	0.130	1.35	1.00	1.00	6.74E-02	2.94E-03	4.24E-04	7.08E-02
Vanadium	1.98E+03	9.62E+00	4.13E-01	0.0794	0.0019	0.130	1.35	1.00	1.00	5.66E-01	2.79E+00	3.98E-02	3.40E+00

Notes:

[1] Mean UCL sediment concentration ftom Hudson Branch (see Table B-3).

[2] Mean UCL aquatic yegetation concentration from Table 6-3.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Mean UCL plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean UCL sediment concentration * sediment ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean UCL vegetation, sediment and surface water exposure doses.

Table 6-6
Mallard - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Mean Sediment Concentration (mg/kg) [1]	Mean Aquatic Vegetation Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Sediment Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]	Sediment Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]
Inorganics													
Chromium	3.55E+03	1.45E+02	4.83E-02	0.0744	0.0015	0.058	1.04	1.00	1.00	1.04E+01	5.11E+00	2.69E-03	1.55E+01
Vanadium	1.44E+03	6.97E+00	1.83E-01	0.0744	0.0015	0.058	1.04	1.00	1.00	4.99E-01	2.07E+00	1.02E-02	2.58E+00
Sediment PCOPEC	Mean UCL Sediment Concentration (mg/kg) [1]	Mean UCL Aquatic Vegetation Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Sediment Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]	Sediment Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW-day)[8]
Inorganics													
Chromium	4.63E+03	1.90E+02	4.83E-02	0.0744	0.0015	0.058	1.04	1.00	1.00	1.36E+01	6.68E+00	2.69E-03	2.03E+01
Vanadium	1.98E+03	9.62E+00	1.83E-01	0.0744	0.0015	0.058	1.04	1.00	1.00	6.88E-01	2.86E+00	1.02E-02	3.56E+00

Notes:

[1] Mean UCL sediment concentration from Hudson Branch (see Table B-3).

[2] Mean UCL aquatic vegetation concentration from Table 6-3.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Mean UCL plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean UCL sediment concentration * sediment ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean UCL vegetation, sediment and surface water exposure doses.

Table 6-7
Little Brown Bat - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Mean Aquatic Invertebrate Concentration (mg/kg)[1]	Mean Surface Water Concentration (mg/L)[2]	Food Ingestion Rate (kg/day)[3]	Surface Water Ingestion Rate (L/day)[3]	Body Weight (kg)[3]	Area Use Factor[3]	Temporal Use Factor[3]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[4]	Surface Water Exposure Dose (mg/kg/BW-day)[5]	Total Mean Exposure Dose (mg/kg/BW-day)[6]
Inorganics										
Antimony	5.70E+01	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	1.22E+01	0.00E+00	1.22E+01
Arsenic	1.68E+00	2.28E-03	0.0016	0.001	0.0075	1.00	1.00	3.58E-01	3.04E-04	3.58E-01
Barium	2.62E+02	6.35E-02	0.0016	0.001	0.0075	1.00	1.00	5.60E+01	8.47E-03	5.60E+01
Beryllium	7.13E+00	1.20E-03	0.0016	0.001	0.0075	1.00	1.00	1.52E+00	1.60E-04	1.52E+00
Chromium	2.34E+02	4.83E-02	0.0016	0.001	0.0075	1.00	1.00	4.99E+01	6.44E-03	4.99E+01
Cobalt	1.99E+01	5.44E-03	0.0016	0.001	0.0075	1.00	1.00	4.25E+00	7.25E-04	4.25E+00
Copper	4.76E+01	1.18E-02	0.0016	0.001	0.0075	1.00	1.00	1.01E+01	1.57E-03	1.01E+01
Manganese	3.91E+02	7.38E-02	0.0016	0.001	0.0075	1.00	1.00	8.33E+01	9.84E-03	8.33E+01
Mercury	1.02E+00	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	2.17E-01	0.00E+00	2.17E-01
Nickel	2.89E+01	1.08E-02	0.0016	0.001	0.0075	1.00	1.00	6.15E+00	1.44E-03	6.16E+00
Selenium	1.74E+00	2.00E-03	0.0016	0.001	0.0075	1.00	1.00	3.71E-01	2.67E-04	3.71E-01
Vanadium	1.44E+03	1.83E-01	0.0016	0.001	0.0075	1.00	1.00	3.07E+02	2.44E-02	3.07E+02
Zinc	1.91E+02	9.37E-02	0.0016	0.001	0.0075	1.00	1.00	4.08E+01	1.25E-02	4.08E+01
Sediment PCOPEC	Mean UCL Aquatic Invertebrate Concentration (mg/kg)[1]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[3]	Surface Water Ingestion Rate (L/day)[3]	Body Weight (kg)[3]	Area Use Factor[3]	Temporal Use Factor[3]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[4]	Surface Water Exposure Dose (mg/kg/BW-day)[5]	Total Mean UCL Exposure Dose (mg/kg/BW-day)[6]
Inorganics										
Antimony	7.51E+01	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	1.60E+01	0.00E+00	1.60E+01
Arsenic	2.21E+00	2.28E-03	0.0016	0.001	0.0075	1.00	1.00	4.71E-01	3.04E-04	4.71E-01
Barium	3.09E+02	6.35E-02	0.0016	0.001	0.0075	1.00	1.00	6.59E+01	8.47E-03	6.59E+01
Beryllium	9.81E+00	1.20E-03	0.0016	0.001	0.0075	1.00	1.00	2.09E+00	1.60E-04	2.09E+00
Chromium	3.06E+02	4.83E-02	0.0016	0.001	0.0075	1.00	1.00	6.52E+01	6.44E-03	6.53E+01
Cobalt	2.60E+01	5.44E-03	0.0016	0.001	0.0075	1.00	1.00	5.55E+00	7.25E-04	5.55E+00
Copper	5.14E+01	1.18E-02	0.0016	0.001	0.0075	1.00	1.00	1.10E+01	1.57E-03	1.10E+01
Manganese	4.87E+02	7.38E-02	0.0016	0.001	0.0075	1.00	1.00	1.04E+02	9.84E-03	1.04E+02
Mercury	1.46E+00	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	3.11E-01	0.00E+00	3.11E-01
Nickel	3.85E+01	1.08E-02	0.0016	0.001	0.0075	1.00	1.00	8.22E+00	1.44E-03	8.22E+00
Selenium	2.09E+00	2.00E-03	0.0016	0.001	0.0075	1.00	1.00	4.46E-01	2.67E-04	4.46E-01
Vanadium	1.98E+03	1.83E-01	0.0016	0.001	0.0075	1.00	1.00	4.23E+02	2.44E-02	4.23E+02
Zinc	2.49E+02	9.37E-02	0.0016	0.001	0.0075	1.00	1.00	5.31E+01	1.25E-02	5.31E+01

Notes:

[1] Mean and mean UCl. aquatic invertebrate concentrations from Table 6-4.

Table 6-7
Little Brown Bat - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

[2] Maximum surface water concentration from Table 2-1.

[3] from Table 4-1.

[4] Mean or mean UCL aquatic invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[5] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Sum of mean or mean UCL aquatic invertebrate and surface water exposure doses.

Table 6-8
Tree Swallow - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Mean Aquatic Invertebrate Concentration (mg/kg)[1]	Mean Surface Water Concentration (mg/L)[2]	Food Ingestion Rate (kg/day)[3]	Surface Water Ingestion Rate (L/day)[3]	Body Weight (kg)[3]	Area Use Factor[3]	Temporal Use Factor[3]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[4]	Surface Water Exposure Dose (mg/kg/BW-day)[5]	Total Mean Exposure Dose (mg/kg/BW-day)[6]
Pesticides										
4,4'-DDD	2.45E-01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	1.36E-01	0.00E+00	1.36E-01
4,4'-DDE	4.97E-02	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	2.75E-02	0.00E+00	2.75E-02
4,4'-DDT	2.79E-02	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	1.54E-02	0.00E+00	1.54E-02
PCBs										
Aroclor 1248	3.66E-01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	2.02E-01	0.00E+00	2.02E-01
Inorganics										
Antimony	7.51E+01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	4.15E+01	0.00E+00	4.15E+01
Arsenic	1.68E+00	2.28E-03	0.0116	0.004	0.0210	1.00	1.00	9.26E-01	4.34E-04	9.26E-01
Barium	2.62E+02	6.35E-02	0.0116	0.004	0.0210	1.00	1.00	1.45E+02	1.21E-02	1.45E+02
Beryllium	9.81E+00	2.60E-03	0.0116	0.004	0.0210	1.00	1.00	5.42E+00	4.95E-04	5.42E+00
Chromium	2.34E+02	4.83E-02	0.0116	0.004	0.0210	1.00	1.00	1.29E+02	9.20E-03	1.29E+02
Cobalt	1.99E+01	5.44E-03	0.0116	0.004	0.0210	1.00	1.00	1.10E+01	1.04E-03	1.10E+01
Copper	4.76E+01	1.18E-02	0.0116	0.004	0.0210	1.00	1.00	2.63E+01	2.25E-03	2.63E+01
Lead	8.94E+00	2.08E-03	0.0116	0.004	0.0210	1.00	1.00	4.94E+00	3.96E-04	4.94E+00
Manganese	3.91E+02	7.38E-02	0.0116	0.004	0.0210	1.00	1.00	2.16E+02	1.41E-02	2.16E+02
Mercury	1.02E+00	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	5.62E-01	0.00E+00	5.62E-01
Nickel	2.89E+01	1.08E-02	0.0116	0.004	0.0210	1.00	1.00	1.59E+01	2.06E-03	1.59E+01
Selenium	1.74E+00	2.00E-03	0.0116	0.004	0.0210	1.00	1.00	9.61E-01	3.81E-04	9.62E-01
Vanadium	1.44E+03	1.83E-01	0.0116	0.004	0.0210	1.00	1.00	7.94E+02	3.49E-02	7.94E+02
Zinc	1.91E+02	9.37E-02	0.0116	0.004	0.0210	1.00	1.00	1.06E+02	1.78E-02	1.06E+02
Sediment PCOPEC	Mean UCL Aquatic Invertebrate Concentration (mg/kg)[1]	Mean Surface Water Concentration (mg/L)[2]	Food Ingestion Rate (kg/day)[3]	Surface Water Ingestion Rate (L/day)[3]	Body Weight (kg)[3]	Area Use Factor[3]	Temporal Use Factor[3]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[4]	Surface Water Exposure Dose (mg/kg/BW-day)[5]	Total Mean UCL Exposure Dose (mg/kg/BW day)[6]
Pesticides										
4,4'-DDD	6.26E-01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	3.46E-01	0.00E+00	3.46E-01
4,4'-DDE	9.15E-02	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	5.06E-02	0.00E+00	5.06E-02
4,4'-DDT	4.59E-02	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	2.53E-02	0.00E+00	2.53E-02
PCBs										
Aroclor 1248	1.34E+00	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	7.40E-01	0.00E+00	7.40E-01

Table 6-8
Tree Swallow - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Mean Aquatic Invertebrate Concentration (mg/kg)[1]	Mean Surfaee Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[3]	Surface Water Ingestion Rate (L/day)[3]	Body Weight (kg)[3]	Area Use Factor[3]	Temporal Use Factor[3]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[4]	Surface Water Exposure Dose (mg/kg/BW-day)[3]	Total Mean Exposure Dose (mg/kg/BW-day)[6]
Inorganics										
Antimony	7.51E+01	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	4.15E+01	0.00E+00	4.15E+01
Arsenic	2.21E+00	2.28E-03	0.0116	0.004	0.0210	1.00	1.00	1.22E+00	4.34E-04	1.22E+00
Barium	3.09E+02	6.35E-02	0.0116	0.004	0.0210	1.00	1.00	1.71E+02	1.21E-02	1.71E+02
Beryllium	9.81E+00	2.60E-03	0.0116	0.004	0.0210	1.00	1.00	5.42E+00	4.95E-04	5.42E+00
Chromium	3.06E+02	4.83E-02	0.0116	0.004	0.0210	1.00	1.00	1.69E+02	9.20E-03	1.69E+02
Cobalt	2.60E+01	5.44E-03	0.0116	0.004	0.0210	1.00	1.00	1.44E+01	1.04E-03	1.44E+01
Copper	5.14E+01	1.18E-02	0.0116	0.004	0.0210	1.00	L00	2.84E+01	2.25E-03	2.84E+01
Lead	1.16E+01	2.08E-03	0.0116	0.004	0.0210	1.00	1.00	6.39E+00	3.96E-04	6.39E+00
Manganese	4.87E+02	7.38E-02	0.0116	0.004	0.0210	1.00	1.00	2.69E+02	1.41E-02	2.69E+02
Mercury	1.46E+00	0.00E+00	0.0116	0.004	0.0210	1.00	1.00	8.06E-01	0.00E+00	8.06E-01
Nickel	3.85E+01	1.08E-02	0.0116	0.004	0.0210	1.00	1.00	2.13E+01	2.06E-03	2.13E+01
Selenium	2.09E+00	2.00E-03	0.0116	0.004	0.0210	1.00	1.00	1.15E+00	3.81E-04	1.15E+00
Vanadium	1.98E+03	1.83E-01	0.0116	0.004	0.0210	1.00	1.00	1.10E+03	3.49E-02	1.10E+03
Zinc	2.49E+02	9.37E-02	0.0116	0.004	0.0210	1.00	1.00	1.37E+02	1.78E-02	1.37E+02

Notes:

[1] Mean and mean sUCL aquatic invertebrate concentrations from Table 6-4.

[2] Maximum surface water concentration from Table 2-1.

[3] from Table 4-1.

[4] Mean or mean UCL aquatic invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[5] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Sum of mean or mean UCL aquatic invertebrate and surface water exposure doses.

Tabic 6-9
Avian and Mammalian Chronic MATC Toxicity Reference Values
SMC Facility
Newfield, New Jersey

PCOPEC	Avian NOAEL	Avian LOAEL	Reference	Avian MATC TRV (mg/kg-BW/day)[c]	Mammalian NOAEL	Mammalian LOAEL	Reference	Mammal MATC TRV (mg/kg-BW/day)[c]
Pesticidcs/PCBs								
4,4-DDD	-	-	-	-	-	-	-	-
4,4-DDE	-	-	-	-	-	-	-	-
4,4'-DDT	-	-	-	-	-	-	-	-
Total DDT	0.227	11.0 b	USEPA, 2007b	1.58	0.147	18.8 b	USEPA, 2007b	1.66
Aroclor 1248	0.36	1.80	Sample et al., 1996	0.80	0.50	2.50	Sample et al., 1996	1.12
Aroclor 1254	0.36	1.80	Sample et al., 1996	0.80	0.14	0.68	Sample et al., 1996	0.30
Inorganics								
Antimpny	NA	NA	-	-	0.059	55.7 b	USEPA, 2005a	1.81
Arsenic	2.24	11.2 a	USEPA, 2005b	5.01	1.04	9.72 b	USEPA, 2005b	3.18
Barium	20.8	41.7	Sample et al., 1996	29.5	51.8	246 b	USEPA, 2005c	112.8
Beryllium	NA	NA	-	-	0.532	2.66 a	USEPA, 2005d	1.19
Cadmium	1.47	5.88 b	USEPA, 2005e	2.94	0.77	10.3 b	USEPA, 2005e	2.82
Chromiuin	2.66	8.35 b	USEPA, 2008	4.71	2.40	12.0 a	USEPA, 2008	5.37
Cobalt	7.61	17.1 b	USEPA, 2005d	11.4	7.33	19.3 b	USEPA, 2005f	11.9
Copper	4.05	36.8 b	USEPA, 2007a	12.2	5.60	156 b	USEPA, 2007a	29.5
Lead	1.63	53.8 b	USEPA, 2005g	9.36	4.70	138 b	USEPA, 2005g	25.4
Manganese	179	377 b	USEPA, 2007c	260	59.4	192 b	USEPA, 2007c	107
Mercury	0.039	0.195 a	USEPA, 2002	0.087	0.25	4.00 a	USEPA, 2002	1.00
Nickel	6.71	26.8 b	USEPA, 2007d	13.4	1.70	37.8 b	USEPA, 2007d	8.02
Selenium	0.29	2.08 b	USEPA, 2007e	0.78	0.143	1.00 b	USEPA, 2007e	0.38
Vanadium	0.34	2.49 b	USEPA, 2005h	0.93	4.16	8.76 b	USEPA, 2005h	6.04
Zinc	66.1	174 b	USEPA, 2007f	107	60.0	741 a	USEPA, 2007f	211

Notes:

PCOPEC - preliminary contaminant of potential ecological concern

NOAEL - no observable adverse effect level from Table 3-4

LOAEL - lowest observable adverse effect level

NA = Toxicity reference value not available

a: Uncertainty factor of 5 applied to NOAEL

b: Geometric mean of LOAELs for reproduction, growth and survival bounded by NOAEL

c: Geometric mean of NOAEL and LOAEL TRVs.

Table 6-10
Semi-Aquatic Wildlife Receptors Mean and Mean UCL Risk Characterization - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Avian MATC TRV (mg/kg-BW/day) [1]	Mammalian MATC TRV (mg/kg-BW/day) [2]	Mean Muskrat Dose (mg/kg/BW-day) [3]	Mean Mallard Dose (mg/kg/BW-day) [4]	Mean Little Brown Bat Dose (mg/kg/BW-day) [5]	Mean Tree Swallow Dose (mg/kg/BW-day) [6]	Mean Muskrat MATC HQ[7]	Mean Mallard MATC HQ[7]	Mean Little Brown Bat MATC HQ[7]	Mean Tree Swallow MATC HQ[7]
Pesticides										
4,4'-DDD	-	-	NRP	NRP	NRP	1.36E-01	-	-	-	-
4,4'-DDE	-	-	NRP	NRP	NRP	2.75E-02	-	-	-	-
4,4'-DDT	-	-	NRP	NRP	NRP	1.54E-02	-	-	-	-
Total DDT	1.58	1.66	NRP	NRP	NRP	1.78E-01	-	-	-	1.E-01
PCBs										
Aroclor 1248	0.80	1.12	NRP	NRP	NRP	2.02E-01	-	-	-	3E-01
Inorganics										
Antimony	NA	1.81	1.83E-01	-	1.22E+01	-	1E-01	-	7E+00	-
Arsenic	5.01	3.18	NRP	NRP	3.58E-01	9.27E-01	-	-	1.E-01	2E-01
Barium	29.5	113	NRP	NRP	5.60E+01	1.45E+02	-	-	5.E-01	5E+00
Beryllium	NA	1.19	NRP	-	1.52E+00	-	-	-	1.E+00	-
Chromium	4.71	5.37	1.35E+01	1.55E+01	4.99E+01	1.29E+02	3E+00	3E+00	9E+00	2.7E+01
Cobalt	11.4	11.9	NRP	NRP	4.25E+00	1.10E+01	-	-	4.E-01	1E+00
Copper	12.2	29.5	NRP	NRP	1.01E+01	2.63E+01	-	-	3.E-01	2E+00
Lead	9.36	25.4	NRP	NRP	NRP	4.94E+00	-	-	-	5E-01
Manganese	260	107	NRP	NRP	8.34E+01	2.16E+02	-	-	8.E-01	8E-01
Mercury	0.087	1.00	NRP	NRP	2.17E-01	5.62E-01	-	-	2.E-01	6E+00
Nickel	13.4	8.02	6.59E-01	NRP	6.16E+00	1.59E+01	8E-02	-	8E-01	1E+00
Selenium	0.78	0.38	5.80E-02	NRP	3.72E-01	9.62E-01	2E-01	-	1E+00	1E+00
Vanadium	0.93	6.04	2.47E+00	2.50E+00	3.07E+02	7.94E+02	4E-01	3E+00	5.1E+01	8.5E+02
Zinc	107	211	NRP	NRP	4.08E+01	1.06E+02	-	-	2.E-01	1E+00
						Total Hazard Index	3E+00	6E+00	7.2E+01	9.0E+02

Sediment PCOPEC	Avian MATC TRV (mg/kg-BW/day) [1]	Mammalian MATC TRV (mg/kg-BW/day) [2]	Mean UCL Muskrat Dose (mg/kg/BW-day) [3]	Mean UCL Mallard Dose (mg/kg/BW-day) [4]	Mean UCL Little Brown Bat Dose (mg/kg/BW-day) [5]	Mean UCL Tree Swallow Dose (mg/kg/BW-day) [6]	Mean UCL Muskrat NOAEL HQ[7]	Mean UCL Mallard NOAEL HQ[7]	Mean UCL Little Brown Bat NOAEL HQ[7]	Mean UCL Tree Swallow NOAEL HQ[7]
Pesticides										
4,4'-DDD	-	-	NRP	NRP	NRP	1.36E-01	-	-	-	-
4,4'-DDE	-	-	NRP	NRP	NRP	2.75E-02	-	-	-	-
4,4'-DDT	-	-	NRP	NRP	NRP	1.54E-02	-	-	-	-
Total DDT	1.58	1.66	NRP	NRP	NRP	1.78E-01	-	-	-	1.E-01
PCBs										
Aroclor 1248	0.8	1.12	NRP	NRP	NRP	2.02E-01	-	-	-	3E-01

Table 6-10
Semi-Aquatic Wildlife Receptors Mean and Mean UCL Risk Characterization - Hudson Branch
SMC Facility
Newfield, New Jersey

Sediment PCOPEC	Avian MATC TRV (mg/kg-BW/day) [1]	Mammalian MATC TRV (mg/kg-BW/day) [2]	Mean UCL Muskrat Dose (mg/kg/BW-day) [3]	Mean UCL Mallard Dose (mg/kg/BW-day) [4]	Mean UCL Little Brown Bat Dose (mg/kg/BW-day) [5]	Mean UCL Tree Swallow Dose (mg/kg/BW-day) [6]	Mean UCL Muskrat NOAEL HQ [7]	Mean UCL Mallard NOAEL HQ [7]	Mean UCL Little Brown Bat NOAEL HQ [7]	Mean UCL Tree Swallow NOAEL HQ [7]
Inorganics										
Antimony	NA	1.81	2.39E-01	-	1.60E+01	-	1E-01	-	9E+00	-
Arsenic	5.01	3.18	NRP	NRP	4.72E-01	1.22E+00	-	-	1E-01	2E-01
Barium	29.5	112.8	NRP	NRP	6.59E+01	1.71E+02	-	-	6E-01	6E+00
Beryllium	NA	1.19	NRP	-	2.09E+00	-	-	-	2E+00	-
Chromium	4.71	5.37	1.77E+01	2.03E+01	6.53E+01	1.69E+02	3E+00	4E+00	1.2E+01	3.6E+01
Cobalt	11.40	11.90	NRP	NRP	5.55E+00	1.44E+01	-	-	5E-01	1E+00
Copper	12.20	29.50	NRP	NRP	1.10E+01	2.84E+01	-	-	4E-01	2E+00
Lead	9.36	25.40	NRP	NRP	NRP	6.40E+00	-	-	-	7E-01
Manganese	260	107.0	NRP	NRP	1.04E+02	2.69E+02	-	-	1E+00	1E+00
Mercury	0.087	1.000	NRP	NRP	3.11E-01	8.06E-01	-	-	3E-01	9E+00
Nickel	13.4	8.02	8.46E-01	NRP	8.22E+00	2.13E+01	1E-01	-	1E+00	2E+00
Selenium	0.78	0.38	7.08E-02	NRP	4.46E-01	1.16E+00	2E-01	-	1E+00	1E+00
Vanadium	0.93	6.04	3.40E+00	3.56E+00	4.23E+02	1.10E+03	6E-01	4E+00	7.0E+01	1.2E+03
Zinc	107	211.0	NRP	NRP	5.31E+01	1.37E+02	-	-	3E-01	1E+00
						Total Hazard Index	4E+00	8E+00	9.8E+01	1.2E+03

Notes:

[1] Avian MATC TRVs from Table 6-9 (applies to mallard and tree swallow).

[2] Mammalian MATC TRVs from Tabic 6-9 (applies to muskrat and little brown bat).

[3] Mean and mean UCL muskrat exposure doses from Table 6-5.

[4] Mean and mean UCL mallard exposure doses from Table 6-6.

[5] Mean and mean UCL little brown bat exposure doses from Table 6-7.

[6] Mean and mean UCL tree swallow exposure doses from Table 6-8.

[7] HQ (Hazard Quotient) = Mean or Mean UCL exposure dose / TRV.

NA - Not available

NRP - No risk predicted (not at risk based on maximum exposure and NOAEL TRVs - see Table 5-3).

Table 6-11
Terrestrial/Wetland Plant Risk Characterization - Surface Soils
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg)[1]	Plant TRV[2]	Plant HQ[3]	# Samples > Plant TRV[4]
Former Lagoon Area				
Antimony	6.50	5.0	1E+00	1/2 = 50%
Chromium	36.4	NA	-	-
Copper	56.2	70	8E-01	1/9 = 11%
Manganese	283	220	1E+00	2/9 = 22%
Nickel	179	38	5E+00	2/9 = 22%
Vanadium	671	100	7E+00	2/9 = 22%
Eastern Storage Areas				
Antimony	14	5.0	3E+00	3/6 = 50%
Chromium	305	NA	-	-
Cobalt	7.2	13	6E-01	1/24 = 4%
Copper	91	70	1E+00	2/24 = 8%
Lead	77	120	6E-01	2/24 = 8%
Manganese	1,024	220	5E+00	16/24 = 67%
Nickel	460	38	1:2E+01	14/24 = 58%
Vanadium	2,102	100	2.1E+01	18/24 = 75%
Zinc	130	160	8E-01	4/24 = 17%
Southern Area				
Antimony	7.3	5.0	1E+00	4/5 = 80%
Chromium	25	NA	-	-
Manganese	115	220	5E-01	2/20 = 10%
Mercury	0.18	0.30	6E-01	3/20 = 15%
Nickel	60	38	2E+00	3/20 = 15%
Selenium	0.55	0.52	1E+00	1/5 = 20%
Vanadium	398	100	4E+00	12/20 = 60%
Zinc	108	160	7E-01	1/20 = 5%
Hudson Branch Wetland				
Antimony	7.0	5.0	1E+00	2/11 = 18%
Beryllium	30.2	56.8	5E-01	1/23 = 4%
Chromium	3,004	NA	-	-
Cobah	30.0	13	2E+00	3/19 = 16%
Copper	68	70	1E+00	3/40 = 8%
Lead	236	120	2E+00	3/23 = 13%
Manganese	550	220	3E+00	3/23 = 13%
Mercury	0.25	0.30	8E-01	5/23 = 22%
Nickel	746	38	2.0E+01	11/40 = 28%
Selenium	0.41	0.52	8E-01	1/12 = 8%
Vanadium	2,089	100	2.1E+01	23/40 = 58%
Zinc	344	160	2E+00	2/23 = 9%

Notes:

[1] Mean UCL surface soil concentration from Table B-5 through B-8.

NA - Not Available

[2] Plant Toxicity Reference Values (TRVs) from Table 3-3.

[3] Hazard Quotient (HQ) = Mean UCL soil concentration / Plant TRV.

[4] Number of samples from total samples where concentrations detected above Plant TRV.

Table 6-12
Estimated Mean and Mean UCL Terrestrial Plant Tissue PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg) [1]	Mean UCL Surface Soil Concentration (mg/kg) [1]	Plant Uptake Factor[2]	Mean Plant Concentration (mg/kg) [3]	Mean UCL Plant Concentration (mg/kg) [2]
Former Lagoon Area					
Vanadium	187	671	0.0049	9.08E-01	3.25E+00
Eastern Storage Areas					
Antimony	10.9	13.8	ln(P)= 0.938*ln(soil) - 3.233 [4]	3.71E-01	4.63E-01
Beryllium	7.04	15.2	ln(P)= 0.7345*ln(soil) - 0.5361 [4]	2.45E+00	4.33E+00
Chromium	194	305	0.0410	7.95E+00	1.25E+01
Copper	30.1	91.4	ln(P)= 0.394*ln(soil) + 0.668 [4]	7.46E+00	L16E+01
Lead	51.0	77.4	ln(P)=0.561*ln(soil) - 1.328 [4]	2.41E+00	3.04E+00
Nickel	218	460	ln(P)= 0.748*ln(soil) - 2.223 [4]	6.08E+00	1.06E+01
Vanadium	1,241	2,102	0.0049	6.02E+00	1.02E+01
Southern Area					
Vanadium	165	398	0.0049	8.00E-01	1.93E+00
Hudson Branch Wetland					
Beryllium	4.16	30.2	ln(P)= 0.7345*lh(soil) - 0.5361 [4]	1.67E+00	7.15E+00
Chromium	918	3,004	0.0410	3.76E+01	1.23E+02
Copper	44.7	68.2	ln(P)= 0.394*ln(soil) + 0.668 [4]	8.72E+00	1.03E+01
Lead	84.6	236	ln(P)=0.561*ln(soil) - 1.328 [4]	3.20E+00	5.68E+00
Nickel	174	746	ln(P)= 0.748*ln(soil) - 2.223 [4]	5.13E+00	1.53E+01
Vanadium	754	2,089	0.0049	3.66E+00	1.01E+01

Notes:

[1] Mean and mean UCL surface soil concentrations from Tables B-5 through B-8.

[2] Plant uptake factors from Table 4-3.

[3] Plant foliage concentrations presented on dry weight basis

[4] Regression equation cited in source used to calculate plant concentration based on maximum sediment concentration.

Example Calculation - Lead Concentration (Eastern Storage Areas)

ln(P) = 0.561*ln(soil) - 1.328

ln (P) = (0.561 * 5.802) - 1.328

ln (P) = 3.255 - 1.328

P = 6.87 mg/kg

Table 6-13
Estimated Mean and Mean UCL Terrestrial Invertebrate PCOPEC Cbncentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg) [1]	Mean UCL Surface Soil Concentration (mg/kg) [1]	Soil to Earthworm BAF [2]	Mean Invertebrate Concentration (mg/kg) [3]	Mean UCL Invertebrate Concentration (mg/kg) [3]
Former Lagoon Area					
Antimony	5.73	6.50	1.000	5.73E+00	6.50E+00
Nickel	35.4	179	0.003	1.17E-01	5.91E-01
Vanadium	187	671	0.042	7.86E+00	2.82E+01
Eastern Storage Areas					
Aroclor 1248	0.41	1.90	ln(I)=1.36*ln(soil) + L41 [4]	1.22E+00	9.81E+00
Aroclor 1254	0.26	1.50	ln(I)=1.36*ln(soil) + 1.41 [4]	6.56E-01	7.11E+00
Antimony	10.9	13.8	1.00	1.09E+01	1.38E+01
Beryllium	7.04	15.2	0.045	3.17E-01	6.86E-01
Cadmium	1.06	2.80	ln(I)=0.795*ln(soil) + 2.114 [4]	8.67E+00	1.88E+01
Chromium	194	305	0.306	5.94E+01	9.33E+01
Copper	30.1	91.4	0.515	1.55E+01	4.71E+01
Lead	51.0	77.4	ln(I)=0.807*ln(soil) - 0.218 [4]	L92E+01	2.69E+01
Nickel	218	460	0.003	7.19E-01	1.52E+00
Vanadium	1,241	2,102	0.042	5.21E+01	8.83E+01
Southern Area					
Antimony	6.05	7.30	1.00	6.05E+00	7.30E+00
Chromium	16.3	24.7	0.306	4.99E+00	7.56E+00
Lead	19.4	28.7	ln(I)=0.807*ln(soil) - 0.218 [4]	8.80E+00	1.21E+01
Nickel	17.6	60.3	0.003	5.81E-02	1.99E-01
Vanadium	165	398	0.042	6.93E+00	1.67E+01
Zinc	39.5	108	ln(I)=0.328*ln(soil) + 4.449 [4]	2.86E+02	3.97E+02
Hudson Branch Wetland					
Antimony	7.00	7.00	1.00	7.00E+00	7.00E+00
Beryllium	4.16	30.2	0.045	1.87E-01	1.36E+00
Cadmium	1.12	5.30	ln(I)=0.795*ln(soil) + 2.114 [4]	9.06E+00	3.12E+01
Chromium	918	3,004	0.306	2.81E+02	9.19E+02
Copper	44.7	68.2	0.515	2.30E+01	3.51E+01
Lead	84.6	236	ln(I)=0.807*ln(soil) - 0.218 [4]	2.89E+01	6.61E+01
Nickel	174	746	0.003	5.74E-01	2.46E+00
Vanadium	754	2,089	0.042	3.17E+01	8.77E+01
Zinc	94.0	344	ln(I)=0.328*ln(soil) + 4.449 [4]	3.80E+02	5.81E+02

Notes:

[1] Mean and mean UCL surface soil concentrationss from Table B-5 through B-8.

[2] BAFs from Table 4-5.

[3] Invertebrate concentrations presented on dry weight basis

[4] Regression equation cited in source used to calculate plant concentration based on maximum suface soil concentration.

Example Calculation - Lead Mean UCL Concentration (Eastem Storage Areas)

ln(I) = 0.807*ln(soil) - 1.218

ln (I) = (0.807 * 4.349) - 0.218

ln (I) = 3.510 - 0.218

I = 26.9 mg/kg

Table 6-14
Mean and Mean UCL Estimated Small Mammal PCOPEC Concentrations
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg) [1]	Mean UCL Surface Soil Concentration (mg/kg) [1]	Soil to Small Mammal BAF [2]	Mean Small Mammal Concentration (mg/kg) [3]	Mean UCL Small Mammal Concentration (mg/kg) [3]
Former Lagoon Area					
Vanadium	187	671	0.0123	2.30E+00	8.25E+00
Eastern Storage Areas					
Vanadium	1,241	2,102	0.0123	1.53E+01	2.59E+01
Southern Area					
Vanadium	165	398	0.0123	2.03E+00	4.90E+00
Hudson Branch Wetland					
Chromium	918	3,004	ln(M)=0.7338*ln(S)-1.4599 [4]	3.47E+01	8.28E+01
Nickel	174	746	ln(M)=0.4658*ln(S)-0.2462 [4]	8.64E+00	1.70E+01
Vanadium	754	2,089	0.0123	9.27E+00	2.57E+01

Notes:

[1] Mean and mean UCL surface soil concentration from Tables B-5 through B-8.

[2] Bioaccumulation factors from Table 4-6.

[3] Small mammal concentrations presented on dry weight basis.

[4] Regression equation used to calculate small mammal concentration (M) based on maximum soil concentration (S).

Table 6-15
Mourning Dove - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg) [1]	Mean Terrestrial Vegetation Concentration (mg/kg) [2]	Mean Surface Water Concentration (mg/L) [3]	Food Ingestion Rate (kg/day) [4]	Surface Soil Ingestion Rate (kg/day) [4]	Surface Water Ingestion Rate (L/day) [4]	Body Weight (kg) [4]	Area Use Factor [4]	Temporal Use Factor [4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day) [5]	Surface Soil Exposure Dose (mg/kg/BW-day) [6]	Surface Water Exposure Dose (mg/kg/BW-day) [7]	Total Mean Exposure Dose (mg/kg/BW-day) [8]
Former Lagoon Area													
Vanadium	1.87E+02	9.08E-01	1.83E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.26E-01	2.34E+00	1.81E-01	2.65E+00
Eastern Storage Areas													
Chrominm	1.94E+02	7.95E+00	4.83E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.10E+00	2.43E+00	4.79E-02	3.57E+00
Copper	3.01E+01	7.46E+00	1.18E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.03E+00	3.76E-01	1.17E-02	1.42E+00
Lead	5.10E+01	2.41E+00	2.08E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	3.33E-01	6.38E-01	2.06E-03	9.72E-01
Nickel	2.18E+02	6.08E+00	1.08E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	8.41E-01	2.73E+00	1.07E-02	3.58E+00
Vanadium	1.24E+03	6.02E+00	1.83E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	8.33E-01	1.55E+01	1.81E-01	1.65E+01
Southern Area													
Vanadium	1.65E+02	8.00E-01	1.83E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.11E-01	2.06E+00	1.81E-01	2.35E+00
Hudson Branch Wetland													
Chromium	9.18E+02	3.76E+01	4.83E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	5.21E+00	1.15E+01	4.79E-02	1.67E+01
Copper	4.47E+01	8.72E+00	1.18E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.21E+00	5.59E-01	1.17E-02	1.78E+00
Lead	8.46E+01	3.20E+00	2.08E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	4.42E-01	1.06E+00	2.06E-03	1.50E+00
Nickel	1.74E+02	5.13E+00	1.08E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	7.10E-01	2.18E+00	1.07E-02	2.90E+00
Vanadium	7.54E+02	3.66E+00	4.13E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	5.06E-01	9.43E+00	4.10E-01	1.03E+01

Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg) [1]	Mean UCL Terrestrial Vegetation Concentration (mg/kg) [2]	Mean Surface Water Concentration (mg/L) [4]	Food Ingestion Rate (kg/day) [4]	Surface Soil Ingestion Rate (kg/day) [4]	Surface Water Ingestion Rate (L/day) [4]	Body Weight (kg) [4]	Area Use Factor [4]	Temporal Use Factor [4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day) [5]	Surface Soil Exposure Dose (mg/kg/BW-day) [6]	Surface Water Exposure Dose (mg/kg/BW-day) [7]	Total Mean UCL Exposure Dose (mg/kg/BW day) [8]
Former Lagoon Area													
Vanadium	6.71E+02	3.25E+00	1.83E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	4.50E-01	8.39E+00	1.81E-01	9.02E+00
Eastern Storage Areas													
Chromium	3.05E+02	1.25E+01	4.83E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.73E+00	3.81E+00	4.79E-02	5.59E+00
Copper	9.14E+01	1.16E+01	1.18E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.60E+00	1.14E+00	1.17E-02	2.75E+00
Lead	7.74E+01	3.04E+00	2.08E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	4.21E-01	9.68E-01	2.06E-03	1.39E+00
Nickel	4.60E+02	1.06E+01	1.08E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.47E+00	5.75E+00	1.07E-02	7.23E+00
Vanadium	2.10E+03	1.02E+01	1.83E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.41E+00	2.63E+01	1.81E-01	2.79E+01
Southern Area													
Vanadium	3.98E+02	1.93E+00	1.83E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	2.67E-01	4.98E+00	1.81E-01	5.42E+00
Hudson Branch Wetland													
Chromium	3.00E+03	1.23E+02	4.83E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.70E+01	3.76E+01	4.79E-02	5.46E+01
Copper	6.82E+01	1.03E+01	1.18E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	1.42E+00	8.53E-01	1.17E-02	2.29E+00
Lead	2.36E+02	5.68E+00	2.08E-03	0.0166	0.0015	0.119	0.120	1.00	1.00	7.86E-01	2.95E+00	2.06E-03	3.74E+00
Nickel	7.46E+02	1.53E+01	1.08E-02	0.0166	0.0015	0.119	0.120	1.00	1.00	2.11E+00	9.33E+00	1.07E-02	1.14E+01
Vanadium	2.09E+03	1.01E+01	4.13E-01	0.0166	0.0015	0.119	0.120	1.00	1.00	1.40E+00	2.61E+01	4.10E-01	2.79E+01

Notes:

[1] Mean and mean UCL surface soil concentrations frdm Tables B-5 through B-8.

[2] Mean and mean UCL terrestrial vegetation concentrations from Table 6-12.

Table 6-15
Mourning Dove - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg)[4]	Mean Terrestrial Vegetation Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]

[3] Mean surface water concentration from Table B-1.

[4] from Table 4-1.

[5] Mean or mean UCL plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean or mean UCL surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL vegetation, surface soil and surface water exposure doses.

Tabic 6-16
White-Footed Mouse - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Tcrrcstrial/Wctland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg)[1]	Mean Terrestrial Vegetation Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]
Eastern Storage Areas													
Antimony	1.09E+01	3.71E-01	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	5.06E-02	2.97E-02	0.00E+00	8.03E-02
Beryllium	7.04E+00	2.45E+00	1.20E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	3.35E-01	1.92E-02	3.82E-04	3.54E-01
Chromiun	1.94E+02	7.95E+00	4.83E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	1.08E+00	5.29E-01	1.54E-02	1.63E+00
Nickel	2.18E+02	6.08E+00	1.08E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	8.29E-01	5.95E-01	3.44E-03	1.43E+00
Vanadium	1.24E+03	6.02E+00	1.83E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	8.21E-01	3.38E+00	5.82E-02	4.26E+00
Southern Area													
Vanadium	1.65E+02	8.00E-01	1.83E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	1.09E-01	4.50E-01	5.82E-02	6.17E-01
Hudson Branch Wetland													
Beryllium	4.16E+00	1.67E+00	1.20E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	2.27E-01	1.13E-02	3.82E-04	2.39E-01
Chromium	9.18E+02	3.76E+01	4.83E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	5.13E+00	2.50E+00	1.54E-02	7.65E+00
Nickel	1.74E+02	5.13E+00	1.08E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	7.00E-01	4.75E-01	3.44E-03	1.18E+00
Vanadium	7.54E+02	3.66E+00	1.83E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	4.99E-01	2.06E+00	5.82E-02	2.61E+00

Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg)[1]	Mean UCL Terrestrial Vegetation Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Plant Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[5]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW day)[8]
Eastern Storage Areas													
Antimony	1.38E+01	4.63E-01	0.00E+00	0.0030	0.0001	0.007	0.022	1.00	1.00	6.31E-02	3.76E-02	0.00E+00	1.01E-01
Beryllium	1.52E+01	4.33E+00	1.20E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	5.90E-01	4.16E-02	3.82E-04	6.32E-01
Chromium	3.05E+02	1.25E+01	4.83E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	1.71E+00	8.32E-01	1.54E-02	2.55E+00
Nickel	4.60E+02	1.06E+01	1.08E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	1.45E+00	1.25E+00	3.44E-03	2.71E+00
Vanadium	2.10E+03	1.02E+01	1.83E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	1.39E+00	5.73E+00	5.82E-02	7.18E+00
Southern Area													
Vanadium	3.98E+02	1.93E+00	1.83E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	2.63E-01	1.09E+00	5.82E-02	1.41E+00
Hudson Branch Wetland													
Beryllium	3.02E+01	7.15E+00	1.20E-03	0.0030	0.0001	0.007	0.022	1.00	1.00	9.75E-01	8.24E-02	3.82E-04	1.06E+00
Chromium	3.00E+03	1.23E+02	4.83E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	1.68E+01	8.19E+00	1.54E-02	2.50E+01
Nickel	7.46E+02	1.53E+01	1.08E-02	0.0030	0.0001	0.007	0.022	1.00	1.00	2.08E+00	2.03E+00	3.44E-03	4.12E+00
Vanadium	2.09E+03	1.01E+01	1.83E-01	0.0030	0.0001	0.007	0.022	1.00	1.00	1.38E+00	5.70E+00	5.82E-02	7.14E+00

Notes:

[1] Mean and mean UCL surface soil concentrations from Tables B-5 through B-8.

[2] Mean and mean UCL terrestrial vegetation concentrations from Table 6-12.

[3] Mean surface water concentration from Table B-1.

[4] from Table 4-1.

[5] Mean or mean UCL plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean or mean UCL surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL vegetation, surface soil and surface water exposure doses.

Tabic 6-17
American Robin - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg)[4]	Mean Terrestrial Invertebrate Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[8]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Vanadium	1.87E+02	7.86E+00	1.83E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	9.60E-01	4.86E-01	2.61E-02	1.47E+00
Eastern Storage Areas													
Aroclor 1248	4.10E-01	1.22E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	1.49E-01	1.06E-03	0.00E+00	1.50E-01
Aroclor 1254	2.60E-01	6.56E-01	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	8.00E-02	6.75E-04	0.00E+00	8.07E-02
Cadmium	1.06E+00	8.67E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	1.06E+00	2.75E-03	0.00E+00	1.06E+00
Chromium	1.94E+02	5.94E+01	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	7.25E+00	5.04E-01	1.44E-02	7.77E+00
Copper	3.01E+01	1.55E+01	2.32E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	1.89E+00	7.82E-02	3.31E-03	1.97E+00
Lead	5.10E+01	1.92E+01	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	2.34E+00	1.32E-01	4.86E-04	2.48E+00
Vanadium	1.24E+03	5.21E+01	1.83E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	6.36E+00	3.22E+00	2.61E-02	9.61E+00
Southern Area													
Chromium	1.63E+01	4.99E+00	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	6.09E-01	4.23E-02	1.44E-02	6.66E-01
Lead	1.94E+01	8.80E+00	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	1.07E+00	5.04E-02	4.86E-04	1.13E+00
Vanadium	1.65E+02	6.93E+00	1.83E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	8.46E-01	4.29E-01	2.61E-02	1.30E+00
Hudson Branch Wetland													
Cadmium	1.12E+00	9.06E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	1.11E+00	2.91E-03	0.00E+00	1.11E+00
Chromium	9.18E+02	2.81E+02	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.43E+01	2.38E+00	1.44E-02	3.67E+01
Copper	4.47E+01	2.30E+01	2.32E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	2.81E+00	1.16E-01	3.31E-03	2.93E+00
Lead	8.46E+01	2.89E+01	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	3.53E+00	2.20E-01	4.86E-04	3.75E+00
Nickel	1.74E+02	5.74E-01	1.92E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	7.01E-02	4.52E-01	2.74E-03	5.25E-01
Vanadium	7.54E+02	3.17E+01	1.83E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.87E+00	1.96E+00	2.61E-02	5.85E+00
Zinc	9.40E+01	3.80E+02	2.87E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	4.63E+01	2.44E-01	4.10E-02	4.66E+01

Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg)[3]	Mean UCL Terrestrial Invertebrate Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[8]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW day)[8]
Former Lagoon Area													
Vanadium	6.71E+02	2.82E+01	1.83E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	3.44E+00	1.74E+00	2.61E-02	5.21E+00
Eastern Storage Areas													
Aroclor 1248	1.90E+00	9.81E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	1.20E+00	4.94E-03	0.00E+00	1.20E+00
Aroclor 1254	1.50E+00	7.11E+00	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	8.68E-01	3.90E-03	0.00E+00	8.72E-01
Cadmium	2.80E+00	1.88E+01	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	2.29E+00	7.27E-03	0.00E+00	2.30E+00
Chromium	3.05E+02	9.33E+01	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	1.14E+01	7.92E-01	1.44E-02	1.22E+01
Copper	9.14E+01	4.71E+01	2.32E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	5.75E+00	2.37E-01	3.31E-03	5.99E+00
Lead	7.74E+01	2.69E+01	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	3.28E+00	2.01E-01	4.86E-04	3.48E+00
Vanadium	2.10E+03	8.83E+01	4.13E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	1.08E+01	5.46E+00	5.90E-02	1.63E+01
Southern Area													
Chromium	2.47E+01	7.56E+00	1.01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	9.23E-01	6.42E-02	1.44E-02	1.00E+00

Table 6-17
American Robin - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg)[4]	Mean Terrestrial Invertebrate Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]
Lead	2.87E+01	1.21E+01	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	1.47E+00	7.45E-02	4.86E-04	1.55E+00
Vanadium	3.98E+02	1.67E+01	4.13E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	2.04E+00	1.03E+00	5.90E-02	3.13E+00
Hudson Branch Wetland													
Cadmium	5.30E+00	3.12E+01	0.00E+00	0.0094	0.0002	0.011	0.077	1.00	1.00	3.81E+00	1.38E-02	0.00E+00	3.82E+00
Chromium	3.06E+03	9.19E+02	L01E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	1.12E+02	7.96E+00	1.44E-02	1.20E+02
Copper	6.82E+01	3.51E+01	2.32E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	4.29E+00	1.77E-01	3.31E-03	4.47E+00
Lead	2.36E+02	6.61E+01	3.40E-03	0.0094	0.0002	0.011	0.077	1.00	1.00	8.07E+00	6.13E-01	4.86E-04	8.68E+00
Nickel	7.46E+02	2.46E+00	1.92E-02	0.0094	0.0002	0.011	0.077	1.00	1.00	3.01E-01	1.94E+00	2.74E-03	2.24E+00
Vanadium	2.09E+03	8.77E+01	4.13E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	1.07E+01	5.43E+00	5.90E-02	1.62E+01
Zinc	3.44E+02	5.81E+02	2.87E-01	0.0094	0.0002	0.011	0.077	1.00	1.00	7.09E+01	8.94E-01	4.10E-02	7.19E+01

Notes:

[1] Mean and mean UCL surface soil concentrations from Tables B-5 thrcugh B-8.

[2] Mean and mean UCL terrestrial invertebrate concentrations from Table 6-13.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Mean or mean UCL invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean or mean UCL surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL invertebrate, surface soil and surface water exposure doses.

Tabic 6-18
Short-Tailed Shrew - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg)[4]	Mean Terrestrial Invertebrate Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[5]
Former Lagoon Area													
Antimony	5.73E+00	5.73E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	7.64E-01	1.15E-01	0.00E+00	8.79E-01
Nickel	3.54E+01	1.17E-01	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	1.56E-02	7.08E-01	2.16E-03	7.26E-01
Vanadium	1.87E+02	7.86E+00	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	1.05E+00	3.74E+00	3.66E-02	4.83E+00
Eastern Storage Areas													
Aroclor 1248	4.10E-01	1.22E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.62E-01	8.20E-03	0.00E+00	1.71E-01
Aroclor 1254	2.60E-01	6.56E-01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	8.74E-02	5.20E-03	0.00E+00	9.26E-02
Antimony	1.09E+01	1.09E+01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.45E+00	2.18E-01	0.00E+00	1.67E+00
Beryllium	7.04E+00	3.17E-01	1.20E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	4.22E-02	1.41E-01	2.40E-04	1.83E-01
Cadmium	1.06E+00	8.67E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.16E+00	2.12E-02	0.00E+00	1.18E+00
Chromium	1.94E+02	5.94E+01	4.83E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	7.92E+00	3.88E+00	9.66E-03	1.18E+01
Copper	3.01E+01	1.55E+01	1.18E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	2.07E+00	6.02E-01	2.36E-03	2.67E+00
Lead	5.10E+01	1.92E+01	2.08E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	2.56E+00	1.02E+00	4.16E-04	3.58E+00
Nickel	2.18E+02	7.19E-01	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	9.59E-02	4.36E+00	2.16E-03	4.46E+00
Vanadium	1.24E+03	5.21E+01	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	6.95E+00	2.48E+01	3.66E-02	3.18E+01
Southern Area													
Antimony	6.05E+00	6.05E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	8.07E-01	1.21E-01	0.00E+00	9.28E-01
Chromium	1.63E+01	4.99E+00	4.83E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	6.65E-01	3.26E-01	9.66E-03	1.00E+00
Nickel	1.76E+01	5.81E-02	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	7.74E-03	3.52E-01	2.16E-03	3.62E-01
Vanadium	1.65E+02	6.93E+00	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	9.24E-01	3.30E+00	3.66E-02	4.26E+00
Zinc	3.95E+01	2.86E+02	9.37E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	3.81E+01	7.90E-01	1.87E-02	3.89E+01
Hudson Branch Wetland													
Antimony	7.00E+00	7.00E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	9.33E-01	1.40E-01	0.00E+00	1.07E+00
Beryllium	4.16E+00	1.87E-01	1.20E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	2.50E-02	8.32E-02	2.40E-04	1.08E-01
Cadmium	1.12E+00	9.06E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.21E+00	2.24E-02	0.00E+00	1.23E+00
Chromium	9.18E+02	2.81E+02	4.83E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	3.75E+01	1.84E+01	9.66E-03	5.58E+01
Copper	4.47E+01	2.30E+01	1.18E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	3.07E+00	8.94E-01	2.36E-03	3.97E+00
Lead	8.46E+01	2.89E+01	2.08E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	3.85E+00	1.69E+00	4.16E-04	5.54E+00
Nickel	1.74E+02	5.74E-01	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	7.66E-02	3.48E+00	2.16E-03	3.56E+00
Vanadium	7.54E+02	3.17E+01	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	4.22E+00	1.51E+01	3.66E-02	1.93E+01
Zinc	9.40E+01	3.80E+02	9.37E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	5.06E+01	1.88E+00	1.87E-02	5.25E+01

Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg)[1]	Mean UCL Terrestrial Invertebrate Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW day)[8]
Former Lagoon Area													
Antimony	6.50E+00	6.50E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	8.67E-01	1.30E-01	0.00E+00	9.97E-01
Nickel	1.79E+02	5.91E-01	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	7.88E-02	3.58E+00	2.16E-03	3.66E+00
Vanadium	6.71E+02	2.82E+01	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	3.76E+00	1.34E+01	3.66E-02	1.72E+01

Table 6-18
Short-Tailed Shrew - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg)[4]	Mean UCL Terrestrial Invertebrate Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW day)[8]
Eastern Storage Areas													
Aroclor 1248	1.90E+00	9.81E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.31E+00	3.80E-02	0.00E+00	1.35E+00
Aroclor 1254	1.50E+00	7.11E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	9.48E-01	3.00E-02	0.00E+00	9.78E-01
Antimony	1.38E+01	1.38E+01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	1.84E+00	2.76E-01	0.00E+00	2.12E+00
Beryllium	1.52E+01	6.86E-01	1.20E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	9.14E-02	3.05E-01	2.40E-04	3.96E-01
Cadmium	2.80E+00	1.88E+01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	2.50E+00	5.60E-02	0.00E+00	2.56E+00
Chromium	3.05E+02	9.33E+01	4.83E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	1.24E+01	6.10E+00	9.66E-03	1.86E+01
Copper	9.14E+01	4.71E+01	1.18E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	6.28E+00	1.83E+00	2.36E-03	8.11E+00
Lead	7.74E+01	2.69E+01	2.08E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	3.58E+00	1.55E+00	4.16E-04	5.13E+00
Nickel	4.60E+02	1.52E+00	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	2.02E-01	9.20E+00	2.16E-03	9.40E+00
Vanadium	2.10E+03	8.83E+01	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	1.18E+01	4.20E+01	3.66E-02	5.38E+01
Southern Area													
Antimony	7.30E+00	7.30E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	9.73E-01	1.46E-01	0.00E+00	1.12E+00
Chromium	2.47E+01	7.56E+00	4.83E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	1.01E+00	4.94E-01	9.66E-03	1.51E+00
Nickel	6.03E+01	1.99E-01	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	2.65E-02	1.21E+00	2.16E-03	1.23E+00
Vanadium	3.98E+02	1.67E+01	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	2.23E+00	7.96E+00	3.66E-02	1.02E+01
Zinc	1.08E+02	3.97E+02	9.37E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	5.30E+01	2.16E+00	1.87E-02	5.52E+01
Hudson Branch Wetland													
Antimony	7.00E+00	7.00E+00	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	9.33E-01	1.40E-01	0.00E+00	1.07E+00
Beryllium	3.02E+01	1.36E+00	1.20E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	1.81E-01	6.04E-01	2.40E-04	7.85E-01
Cadmium	5.30E+00	3.12E+01	0.00E+00	0.0020	0.0003	0.003	0.015	1.00	1.00	4.16E+00	1.06E-01	0.00E+00	4.26E+00
Chromium	3.00E+03	9.19E+02	4.83E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	1.23E+02	6.01E+01	9.66E-03	1.83E+02
Copper	6.82E+01	3.51E+01	1.18E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	4.68E+00	1.36E+00	2.36E-03	6.05E+00
Lead	2.36E+02	6.61E+01	2.08E-03	0.0020	0.0003	0.003	0.015	1.00	1.00	8.81E+00	4.72E+00	4.16E-04	1.35E+01
Nickel	7.46E+02	2.46E+00	1.08E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	3.28E-01	1.49E+01	2.16E-03	1.53E+01
Vanadium	2.09E+03	8.77E+01	1.83E-01	0.0020	0.0003	0.003	0.015	1.00	1.00	1.17E+01	4.18E+01	3.66E-02	5.35E+01
Zinc	3.44E+02	5.81E+02	9.37E-02	0.0020	0.0003	0.003	0.015	1.00	1.00	7.75E+01	6.88E+00	1.87E-02	8.44E+01

Notes:

[1] Mean and mean UCL surface soil concentrations from Tables B-5 through B-8.

[2] Mean and mean UCL terrestrial invertebrate concentrations from Table 6-13.

[3] Mean surface water concentration from Table B-1.

[4] from Table 4-1.

[5] Mean or mean UCL invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean or mean UCL surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL invertebrate, surface soil and surface water exposure doses.

Table 6-19
Red-Tailed Hawk - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg)[3]	Mean Small Mammal Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Small Mammal Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]
Former Lagoon Area													
Vanadium	1.87E+02	2.30E+00	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	1.89E-01	0.00E+00	1.07E-02	1.99E-01
Eastern Storage Areas													
Vanadium	1.24E+03	1.53E+01	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	1.25E+00	0.00E+00	1.07E-02	1.26E+00
Southern Area													
Vanadium	1.65E+02	2.03E+00	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	1.66E-01	0.00E+00	1.07E-02	1.77E-01
Hudson Branch Wetland													
Chromium	9.18E+02	3.47E+01	4.83E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	2.84E+00	0.00E+00	2.82E-03	2.85E+00
Vanadium	7.54E+02	9.27E+00	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	7.61E-01	0.00E+00	1.07E-02	7.71E-01

Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg)[1]	Mean UCL Small Mammal Concentration (mg/kg)[2]	Mean Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Surface Soil Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Small Mammal Exposure Dose (mg/kg/BW-day)[5]	Surface Soil Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW day)[8]
Former Lagoon Area													
Vanadium	6.71E+02	8.25E+00	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	6.77E-01	0.00E+00	1.07E-02	6.87E-01
Eastern Storage Areas													
Vanadium	2.10E+03	2.59E+01	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	2.12E+00	0.00E+00	1.07E-02	2.13E+00
Southern Area													
Vanadium	3.98E+02	4.90E+00	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	4.01E-01	0.00E+00	1.07E-02	4.12E-01
Hudson Branch Wetland													
Chromium	3.00E+03	8.28E+01	4.83E-02	0.0843	0.0000	0.060	1.028	1.00	1.00	6.79E+00	0.00E+00	2.82E-03	6.79E+00
Vanadium	2.09E+03	2.57E+01	1.83E-01	0.0843	0.0000	0.060	1.028	1.00	1.00	2.11E+00	0.00E+00	1.07E-02	2.12E+00

Notes:

[1] Mean and mean UCL surface soil concentrations from Tables B-5 through B-8.

[2] Mean and mean UCL small mammal concentrations from Table 6-14.

[3] Mean surface water concentration from Table B-1.

[4] from Table 4-1.

[5] Mean or mean UCL small mammal concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean or mean UCL surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL small mammal, surface soil and surface water exposure dbses.

Table 6-20
Red Fox - Mean and Mean UCL Estimated PCOPEC Exposure Dose - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Mean Surface Soil Concentration (mg/kg) [1]	Mean Small Mammal Concentration (mg/kg) [2]	Mean Surface Water Concentration (mg/L) [5]	Food Ingestion Rate (kg/day) [4]	Surface Soil Ingestion Rate (kg/day) [4]	Surface Water Ingestion Rate (L/day) [4]	Body Weight (kg) [4]	Area Use Factor [4]	Temporal Use Factor [4]	Small Mammal Exposure Dose (mg/kg/BW-day) [5]	Surface Soil Exposure Dose (mg/kg/BW-day) [6]	Surface Water Exposure Dose (mg/kg/BW-day) [7]	Total Mean Exposure Dose (mg/kg/BW-day) [8]
Eastern Storage													
Vanadium	1.24E+03	1.53E+01	1.83E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	5.89E-01	1.35E+00	1.58E-02	1.96E+00
Hudson Branch Wetland													
Chromium	9.18E+02	3.47E+01	4.83E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	1.34E+00	1.00E+00	4.16E-03	2.34E+00
Nickel	1.74E+02	8.64E+00	1.08E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	3.33E-01	1.90E-01	9.30E-04	5.24E-01
Vanadium	7.54E+02	9.27E+00	1.83E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	3.58E-01	8.21E-01	1.58E-02	1.19E+00
Surface Soil PCOPECs	Mean UCL Surface Soil Concentration (mg/kg) [1]	Mean UCL Small Mammal Concentration (mg/kg) [2]	Mean Surface Water Concentration (mg/L) [5]	Food Ingestion Rate (kg/day) [4]	Surface Soil Ingestion Rate (kg/day) [4]	Surface Water Ingestion Rate (L/day) [4]	Body Weight (kg) [4]	Area Use Factor [4]	Temporal Use Factor [4]	Small Mammal Exposure Dose (mg/kg/BW-day) [5]	Surface Soil Exposure Dose (mg/kg/BW-day) [6]	Surface Water Exposure Dose (mg/kg/BW-day) [7]	Total Mean UCL Exposure Dose (mg/kg/BW day) [8]
Eastern Storage Areas													
Vanadium	2.10E+03	2.59E+01	1.83E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	9.97E-01	2.29E+00	1.58E-02	3.30E+00
Hudson Branch Wetland													
Chromium	3.00E+03	8.28E+01	4.83E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	3.19E+00	3.27E+00	4.16E-03	6.47E+00
Nickel	7.46E+02	1.70E+01	1.08E-02	0.1558	0.0044	0.348	4.040	1.00	1.00	6.57E-01	8.12E-01	9.30E-04	1.47E+00
Vanadium	2.09E+03	2.57E+01	1.83E-01	0.1558	0.0044	0.348	4.040	1.00	1.00	9.91E-01	2.28E+00	1.58E-02	3.28E+00

Notes:

[1] Mean and mean UCL surface soil concentrations from Tables B-5 through B-8.

[2] Mean and mean UCL small mammal concentrations from Table 6-14.

[3] Maximum surface water concentration from Table 2-1.

[4] from Table 4-1.

[5] Mean or mean UCL small mammal concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean or mean UCL surface soil concentration * surface soil ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Maximum surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL small mammal, surface soil and surface water exposure doses.

Table 6-21
Wildlife Receptors Mean and Mean UCL Risk Characterization - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Avian MATC TRV (mg/kg-BW/day)[1]	Mammalian MATC TRV (mg/kg-BW/day)[1]	Mean Mourning Dove Dose (mg/kg-BW/day)[3]	Mean White-footed Mouse Dose (mg/kg-BW/day)[3]	Mean American Robin Dose (mg/kg-BW/day)[4]	Mean Short-Tailed Shrew Dose (mg/kg-BW/day)[5]	Mean Red-Tailed Hawk Dose (ing/kg-BW/day)[6]	Mean Red Fox Dose (mg/kg-BW/day)[7]	Mean Dove HQ[8]	Mean Mouse HQ[8]	Mean Robin HQ[8]	Mean Shrew HQ[8]	Mean Hawk HQ[8]	Mean Fox HQ[8]
Former Lagoon Area														
Antimony	NA	1.81	-	NRP	-	8.79E-01	NRP	NRP	-	-	-	5E-01	-	-
Nickel	13.4	8.02	NRP	NRP	NRP	7.27E-01	NRP	NRP	-	-	-	9E-02	-	-
Vanadium	0.93	6.04	2.65E+00	NRP	1.47E+00	4.87E+00	1.99E-01	NRP	3E+00	-	2E+00	8E-01	2E-01	-
								Total Hazard Index	3E+00	0E+00	2E+00	1E+00	2E-01	0E+00
Eastern Storage														
Aroclor 1248	0.8	1.12	NRP	NRP	1.50E-01	1.71E-01	NRP	NRP	-	-	2E-01	2E-01	-	-
Aroclor 1254	0.80	0.30	NRP	NRP	8.07E-02	9.26E-02	NRP	NRP	-	-	1E-01	3E-01	-	-
Antimony	NA	1.81	-	8.03E-02	-	1.67E+00	NRP	NRP	-	4E-02	-	9E-01	-	-
Beryllium	NA	1.19	-	3.55E-01	-	1.84E-01	NRP	NRP	-	3E-01	-	2E-01	-	-
Cadmium	2.94	2.82	NRP	NRP	1.06E+00	1.18E+00	NRP	NRP	-	-	4E-01	4E-01	-	-
Chromium	4.71	5.37	3.57E+00	1.65E+00	7.77E+00	1.18E+01	NRP	NRP	8E-01	3E-01	2E+00	2E+00	-	-
Copper	12.2	29.5	1.42E+00	NRP	1.97E+00	2.67E+00	NRP	NRP	1E-01	-	2E-01	9E-02	-	-
Lead	9.36	25.4	9.72E-01	NRP	2.48E+00	3.58E+00	NRP	NRP	1E-01	-	3E-01	1E-01	-	-
Nickel	13.4	8.02	3.58E+00	1.43E+00	NRP	4.46E+00	NRP	NRP	3E-01	2E-01	-	6E-01	-	-
Vanadium	0.93	6.04	1.65E+01	4.26E+00	9.65E+00	3.19E+01	1.26E+00	1.96E+00	1.8E+01	7E-01	1.1E+01	5E+00	1E+00	3E-01
								Total Hazard Index	1.9E+01	2E+00	1.3E+01	1.0E+01	1E+00	3E-01
Southern Area														
Antimony	NA	1.81	-	NRP	-	9.28E-01	NRP	NRP	-	-	-	5E-01	-	-
Chromium	4.71	5.37	NRP	NRP	6.66E-01	1.01E+00	NRP	NRP	-	-	1E-01	2E-01	-	-
Lead	9.36	25.40	NRP	NRP	1.13E+00	NRP	NRP	NRP	-	-	1E-01	-	-	-
Nickel	13.4	8.02	NRP	NRP	NRP	3.64E-01	NRP	NRP	-	-	-	5E-02	-	-
Vanadium	0.93	6.04	2.35E+00	6.17E-01	1.30E+00	4.31E+00	1.77E-01	NRP	3E+00	1E-01	1E+00	7E-01	2E-01	-
Zinc	107	211	NRP	NRP	NRP	3.89E+01	NRP	NRP	-	-	-	2E-01	-	-
								Total Hazard Index	3E+00	1E-01	2E+00	2E+00	2E-01	0E+00
Hudson Branch Wetland														
Antimony	NA	1.81	-	NRP	-	1.07E+00	NRP	NRP	-	-	-	6E-01	-	-
Beryllium	NA	1.19	-	2.39E-01	-	1.09E-01	NRP	NRP	-	2E-01	-	9E-02	-	-
Cadmium	2.94	2.82	NRP	NRP	1.11E+00	1.23E+00	NRP	NRP	-	-	4E-01	4E-01	-	-
Chromium	4.71	5.37	1.67E+01	7.65E+00	3.67E+01	5.58E+01	2.85E+00	2.34E+00	4E+00	1E+00	8E+00	1.0E+01	6E-01	4E-01
Copper	12.20	29.50	1.78E+00	NRP	2.93E+00	3.97E+00	NRP	NRP	1E-01	-	2E-01	1E-01	-	-
Lead	9.36	25.40	1.50E+00	NRP	3.75E+00	5.54E+00	NRP	NRP	2E-01	-	4E-01	2E-01	-	-
Nickel	13.4	8.02	2.90E+00	1.18E+00	5.25E-01	3.56E+00	NRP	5.24E-01	2E-01	1E-01	4E-02	4E-01	-	7E-02
Vanadium	0.93	6.04	1.03E+01	2.61E+00	5.85E+00	1.93E+01	7.71E-01	1.19E+00	1.1E+01	4E-01	6E+00	3E+00	8E-01	2E-01
Zinc	107	211	NRP	NRP	4.66E+01	5.26E+01	NRP	NRP	-	-	4E-01	2E-01	-	-
								Total Hazard Index	1.5E+01	2E+00	1.6E+01	1.6E+01	1E+00	7E-01

Table 6-21
Wildlife Receptors Mean and Mean UCL Risk Characterization - Terrestrial/Wetland Habitats
SMC Facility
Newfield, New Jersey

Surface Soil PCOPECs	Avian MATC TRV (mg/kg-BW/day)[1]	Mammalian MATC TRV (mg/kg-BW/day)[2]	Mean UCL Mourning Dove Dose (mg/kg-BW/day)[3]	Mean UCL White-footed Mouse Dose (mg/kg-BW/day)[4]	Mean UCL American Robin Dose (mg/kg-BW/day)[5]	Mean UCL Short-Tailed Shrew Dose (mg/kg-BW/day)[6]	Mean UCL Red-Tailed Hawk Dose (mg/kg-BW/day)[7]	Mean UCL Red Fox Dose (mg/kg-BW/day)[8]	Mean UCL Dove HQ[9]	Mean UCL Mouse HQ[9]	Mean UCL Robin HQ[9]	Mean UCL Shrew HQ[9]	Mean UCL Hawk HQ[9]	Mean UCL Fox HQ[9]
Former Lagoon Area														
Antimony	NA	1.81	-	NRP	-	9.97E-01	NRP	NRP	-	-	-	6E-01	-	-
Nickel	13.4	8.02	NRP	NRP	NRP	3.66E+00	NRP	NRP	-	-	-	5E-01	-	-
Vanadium	0.93	6.04	9.02E+00	NRP	5.21E+00	1.73E+01	6.87E-01	NRP	1E+01	-	6E+00	3E+00	7E-01	-
								Total Hazard Index	1E+01	0E+00	6E+00	4E+00	7E-01	0E+00
Eastern Storage Areas														
Aroclor 1248	0.80	1.12	NRP	NRP	1.20E+00	1.35E+00	NRP	NRP	-	-	2E+00	1E+00	-	-
Aroclor 1254	0.80	0.30	NRP	NRP	8.72E-01	9.78E-01	NRP	NRP	-	-	1E+00	3E+00	-	-
Antimony	NA	1.81	-	1.01E-01	-	2.12E+00	NRP	NRP	-	6E-02	-	1E+00	-	-
Beryllium	NA	1.19	-	6.32E-01	-	3.97E-01	NRP	NRP	-	5E-01	-	3E-01	-	-
Cadmium	2.94	2.82	NRP	NRP	2.30E+00	2.56E+00	NRP	NRP	-	-	8E-01	9E-01	-	-
Chromium	4.71	5.37	5.59E+00	2.57E+00	1.22E+01	1.86E+01	NRP	NRP	1E+00	5E-01	3E+00	3E+00	-	-
Copper	12.2	29.5	2.75E+00	NRP	5.99E+00	8.11E+00	NRP	NRP	2E-01	-	5E-01	3E-01	-	-
Lead	9.36	25.4	1.39E+00	NRP	3.48E+00	5.13E+00	NRP	NRP	1E-01	-	4E-01	2E-01	-	-
Nickel	13.4	8.02	7.23E+00	2.71E+00	NRP	9.41E+00	NRP	NRP	5E-01	3E-01	-	1E+00	-	-
Vanadium	0.93	6.04	2.79E+01	7.25E+00	1.63E+01	5.39E+01	2.14E+00	3.32E+00	3.0E+01	1E+00	1.8E+01	9E+00	2E+00	5E-01
								Total Hazard Index	3.2E+01	3E+00	2.4E+01	2.1E+01	2E+00	5E-01
Southern Area														
Antimony	NA	1.81	-	NRP	-	1.12E+00	NRP	NRP	-	-	-	6E-01	-	-
Chromium	4.71	5.37	NRP	NRP	1.00E+00	1.52E+00	NRP	NRP	-	-	2E-01	3E-01	-	-
Lead	9.36	25.40	NRP	NRP	1.55E+00	NRP	NRP	NRP	-	-	2E-01	-	-	-
Nickel	13.4	8.02	NRP	NRP	NRP	1.24E+00	NRP	NRP	-	-	-	2E-01	-	-
Vanadium	0.93	6.04	5.65E+00	1.48E+00	3.13E+00	1.03E+01	4.12E-01	NRP	6E+00	2E-01	3E+00	2E+00	4E-01	-
Zinc	107	211	NRP	NRP	NRP	5.52E+01	NRP	NRP	-	-	-	3E-01	-	-
								Total Hazard Index	6E+00	2E-01	4E+00	3E+00	4E-01	0E+00
Hudson Branch Wetland														
Antimony	NA	1.81	-	NRP	-	1.07E+00	NRP	NRP	-	-	-	6E-01	-	-
Beryllium	NA	1.19	-	1.06E+00	-	7.86E-01	NRP	NRP	-	9E-01	-	7E-01	-	-
Cadmium	2.94	2.82	NRP	NRP	3.82E+00	4.26E+00	NRP	NRP	-	-	1E+00	2E+00	-	-
Chromium	4.71	5.37	5.46E+01	2.50E+01	1.20E+02	1.83E+02	6.79E+00	6.47E+00	1.2E+01	5E+00	2.5E+01	3.4E+01	1E+00	1E+00
Copper	12.20	29.50	2.29E+00	NRP	4.47E+00	6.05E+00	NRP	NRP	2E-01	-	4E-01	2E-01	-	-
Lead	9.36	25.40	3.74E+00	NRP	8.68E+00	1.35E+01	NRP	NRP	4E-01	-	9E-01	5E-01	-	-
Nickel	13.4	8.02	1.14E+01	4.12E+00	2.24E+00	1.53E+01	NRP	1.47E+00	9E-01	5E-01	2E-01	2E+00	-	2E-01
Vanadium	0.93	6.04	2.79E+01	7.14E+00	1.62E+01	5.35E+01	2.12E+00	3.28E+00	3.0E+01	1E+00	1.7E+01	9E+00	2E+00	5E-01
Zinc	107	211	NRP	NRP	7.19E+01	8.44E+01	NRP	NRP	-	-	7E-01	4E-01	-	-
								Total Hazard Index	4.3E+01	7E+00	4.6E+01	4.9E+01	4E+00	2E+00

Notes:

[1] Avian and mammalian MATC TRVs from Table 6-9.

[2] Mean and mean UCL mourning dove exposure doses from Table 6-15.

[3] Mean and mean UCL white-footed mouse exposure doses from Table 6-16.

[4] Mean and mean UCL American robin exposure doses from Table 6-17.

[5] Mean and mean UCL short-tailed shrew exposure doses from Table 6-18.

[6] Mean and mean UCL red-tailed hawk exposure doses from Table 6-19.

[7] Mean and mean UCL red fox exposure doses from Table 6-20.

[8] HQ (Hazard Quotient) = Maximum exposure dose / TRV.

NA - No TRV available

NRP - No Risk Predicted (not at risk based on maximum exposure - see Table 5-5)

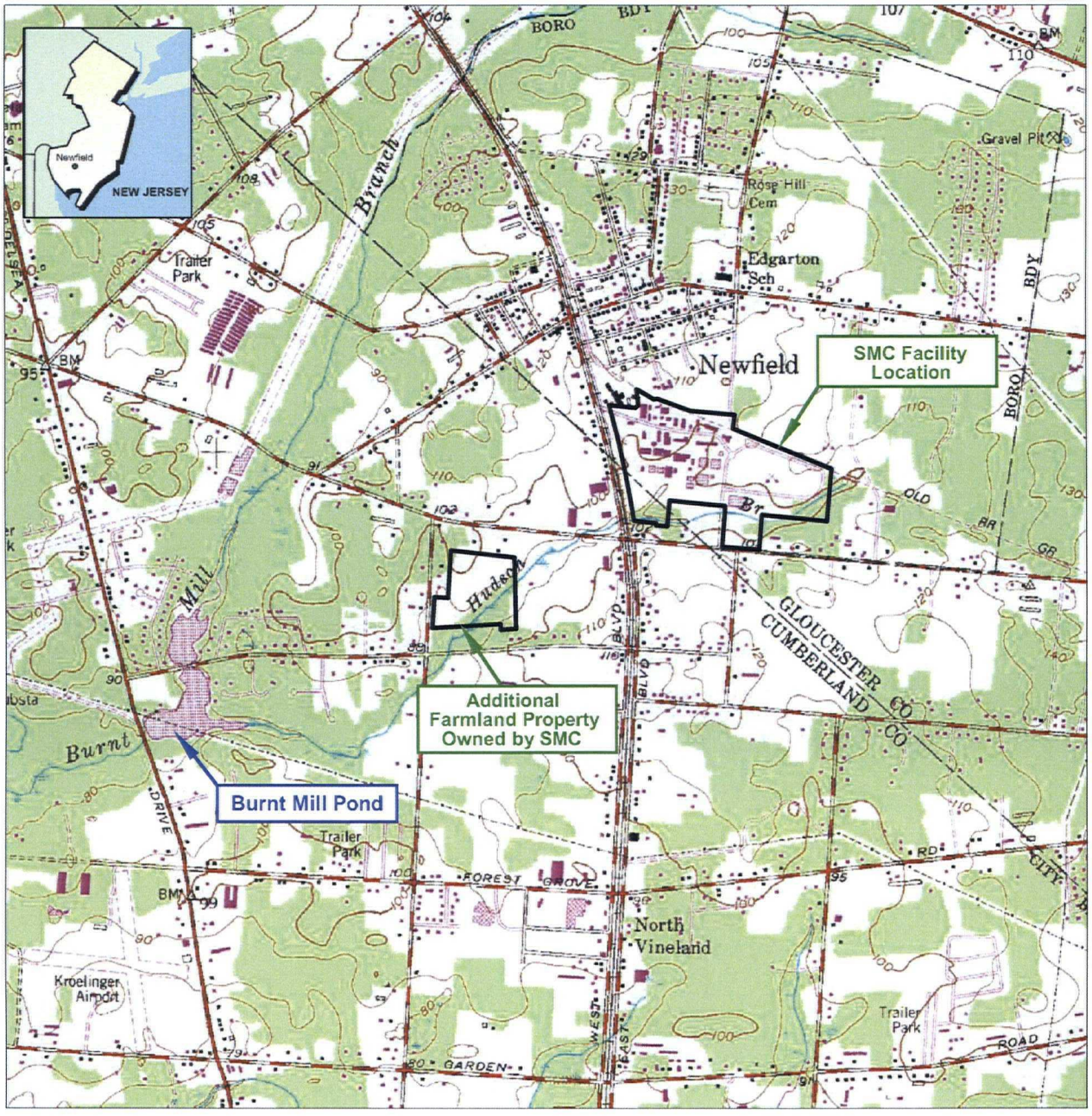
Table 7-1
SLERA and Step 3A Summary
SMC Facility
Newfield, New Jersey

Evaluation Area/Receptor	PCOPEC Risk Drivers	Conclusions/Comments/Data Gaps
Hudson Branch		
Aquatic Invertebrates	Aluminum	Mean surface water > chronic and acute TRVs. Sufficient background surface water/sediment samples not available.
	Chromium	Mean surface water > chronic TRVs. 94% sediment samples > PEC. Dissolved surface water samples not available.
	Copper	Mean surface water > chronic and acute TRVs. 36% sediment samples > PEC. Dissolved surface water samples not available.
	Iron	Mean surface water > chronic TRVs. 7% sediment samples > PEC. Dissolved surface water and background surface water/sediment samples not available.
	Lead	Maximum surface water < chronic TRVs. 47% sediment samples > PEC.
	Manganese	Maximum surface water > chronic TRVs. 7% sediment samples > PEC. No dissolved surface water or background surface water/sediment samples.
	Mercury	Maximum surface water < chronic TRVs. 37% sediment samples > PEC. Background sediment samples not available.
	Nickel	Maximum surface water > chronic TRVs. 76% sediment samples > PEC. Dissolved surface water samples not available.
	Vanadium	Mean surface water > chronic TRVs. No sediment criteria available. Dissolved surface water samples not available.
	Zinc	Mean surface water > chronic and acute TRVs. 16% sediment samples > PEC. Dissolved surface water samples not available.
Mammalian Herbivores	Chromium	Mean exposure dose > MATC. Exposure primarily via plant ingestion. Plant tissue concentrations of chromium not available
Avian Herbivores	Chromium	Mean exposure dose > MATC. Exposure primarily via plant ingestion. Plant tissue concentrations of chromium not available
Mammalian Insectivores	Antimony, Chromium, Vanadium	Mean exposure dose > MATC. Exposure primarily via aquatic invertebrate ingestion. Background sediment and Hudson Branch aquatic invertebrate tissue concentrations of antimony, chromium and vanadium not available
Avian Insectivores	Barium, Chromium, Copper, Mercury, Vanadium	Mean exposure dose > MATC. Exposure primarily via invertebrate ingestion. Background sediment and Hudson Branch invertebrate tissue concentrations of barium, chromium, copper, mercury and vanadium not available
Former Lagoon Area		
Terrestrial Plant Community	None	Surface soil concentrations > plant TRVs < 25% of samples
Avian Herbivores	None	Mean exposure dose < MATC TRV except vanadium. Vanadium exposure from surface soil ingestion with low absorption fraction
Mammalian Herbivores	None	Maximum exposure dose < NOAEL TRVs
Avian Insectivores	None	Mean exposure dose < MATC TRV except vanadium. Vanadium exposure from surface soil ingestion with low absorption fraction
Mammalian Insectivores	None	Mean exposure dose < MATC TRV
Avian Camivores	None	Mean UCL exposure dose < MATC TRV
Mammalian Carnivores	None	Maximum exposure dose < NOAEL TRV
Eastern Storage Areas		
Terrestrial Plant Community	Manganese, Nickel, Vanadium	Surface soil concentrations of manganese, nickel and vanadium detected > plant TRVs in > 50% of samples.
Avian Herbivores	None	Mean exposure dose < MATC TRV except vanadium. Vanadium exposure from surface soil ingestion with low absorption fraction
Mammalian Herbivores	None	Mean exposure dose < MATC TRV
Avian Insectivores	Chromium, Vanadium	Mean exposure dose > MATC TRV. Exposure primarily via terrestrial invertebrate ingestion. Terrestrial invertebrate concentrations of chromium and vanadium not available
Mammalian Insectivores	Chromium, Vanadium	Mean exposure dose > MATC TRV. Terrestrial invertebrate concentrations of chromium and vanadium not available
Avian Camivores	None	Mean exposure dose < MATC TRV
Mammalian Carnivores	None	Mean UCL exposure dose < MATC TRV

Table 7-1
SLERA and Step 3A Summary
SMC Facility
Newfield, New Jersey

Eyaluation Area/Receptor	PCOPEC Risk Drivers	Conclusions/Comments/Data Gaps
Southern Area		
Terrestrial Plant Community	Vanadium	Surface soil concentrations of vanadium detected > plant TRV in 60% of samples.
Avian Herbivores	None	Mean exposure dose < MATC TRV except vanadium. Vanadium exposure from surface soil ingestion with low absorption fraction
Mammalian Herbivores	None	Mean UCL exposure dose < MATC TRV
Avian Insectivores	None	Mean exposure dose < MATC TRV except vanadium. Vanadium exposure from terrestrial invertebrate ingestion < MATC
Mammalian Insectivores	None	Mean exposure dose < MATC TRV
Avian Camivores	None	Mean UCL exposure dose < MATC TRV
Mammalian Camivores	None	Maximum exposure dose < NOAEL TRV
Hudson Branch Wetland		
Terrestrial Plant Community	Nickel, Vanadium	Surface soil concentrations of vanadium detected > plant TRV in 25% of samples.
Avian Herbivores	None	Mean exposure dose < MATC TRV except chromium and vanadium. Chromium and vanadium exposure from surface soil ingestion with low absorption fraction.
Mammalian Herbivores	None	Mean exposure dose < MATC TRV except chromium. Chromium exposure from surface soil ingestion with low absorption fraction
Avian Insectivores	Chromium, Vanadium	Mean exposure dose from invertebrate ingetion > MATC TRV
Mammalian Insectivores	Chromium	Mean exposure dose from invertebrate ingetion > MATC TRV
Avian Camivores	None	Mean exposure dose < MATC TRV
Mammalian Camivores	None	Mean exposure dose < MATC TRV

FIGURES



SOURCE: NEWFIELD, N.J. QUADRANGLE, 1953, PHOTOREVISED 1994, 7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)

SITE PROPERTY BOUNDARY

N

0 2000 FT.

APPROXIMATE SCALE

TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

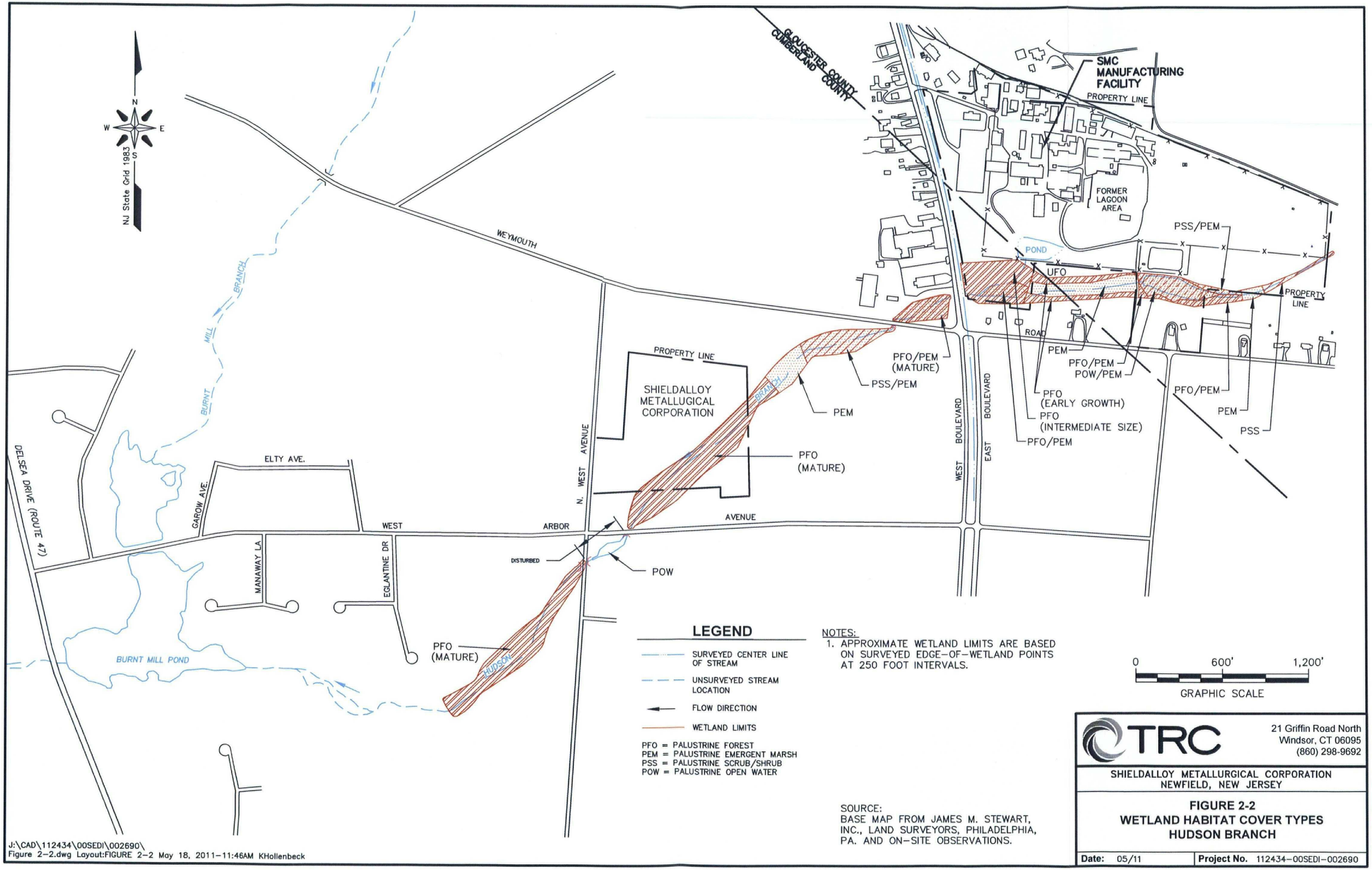
SITE LOCATION MAP

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NO.: 2710ES-112434-00SOIL-002500

JG/LB	DATE: JANUARY 2011	FIGURE: 1

M:\CAD FILES\WORK\2710ES\FSP\FIGURE 1.DWG 01/28/2011 10:10:50AM TAB: LAYOUT



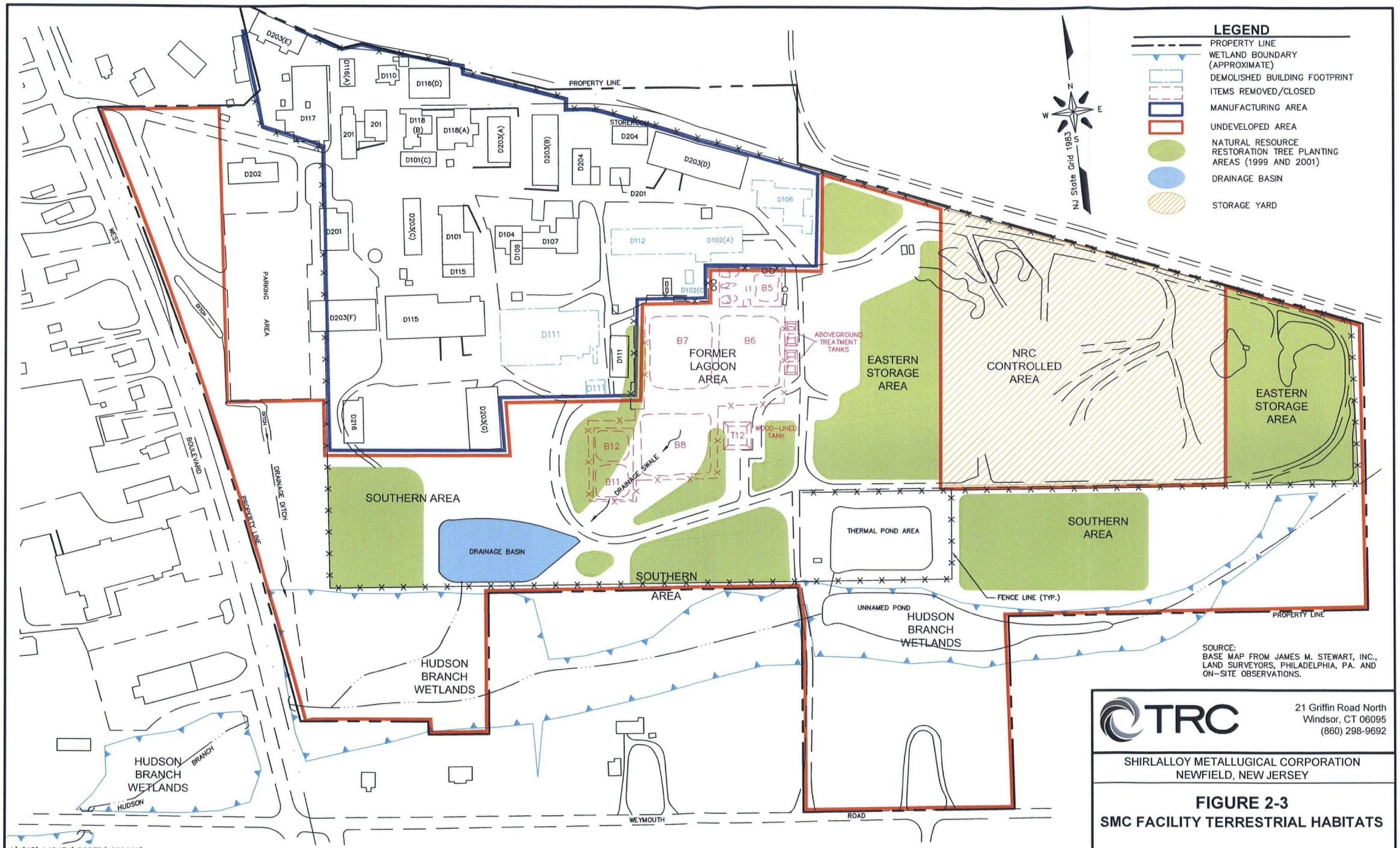
J:\CAD\112434\00SEDI\002690\
Figure 2-2.dwg Layout:FIGURE 2-2 May 18, 2011-11:46AM KHollenbeck

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE 2-2
WETLAND HABITAT COVER TYPES
HUDSON BRANCH

Date: 05/11 | **Project No.** 112434-00SEDI-002690



SOURCE:
BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

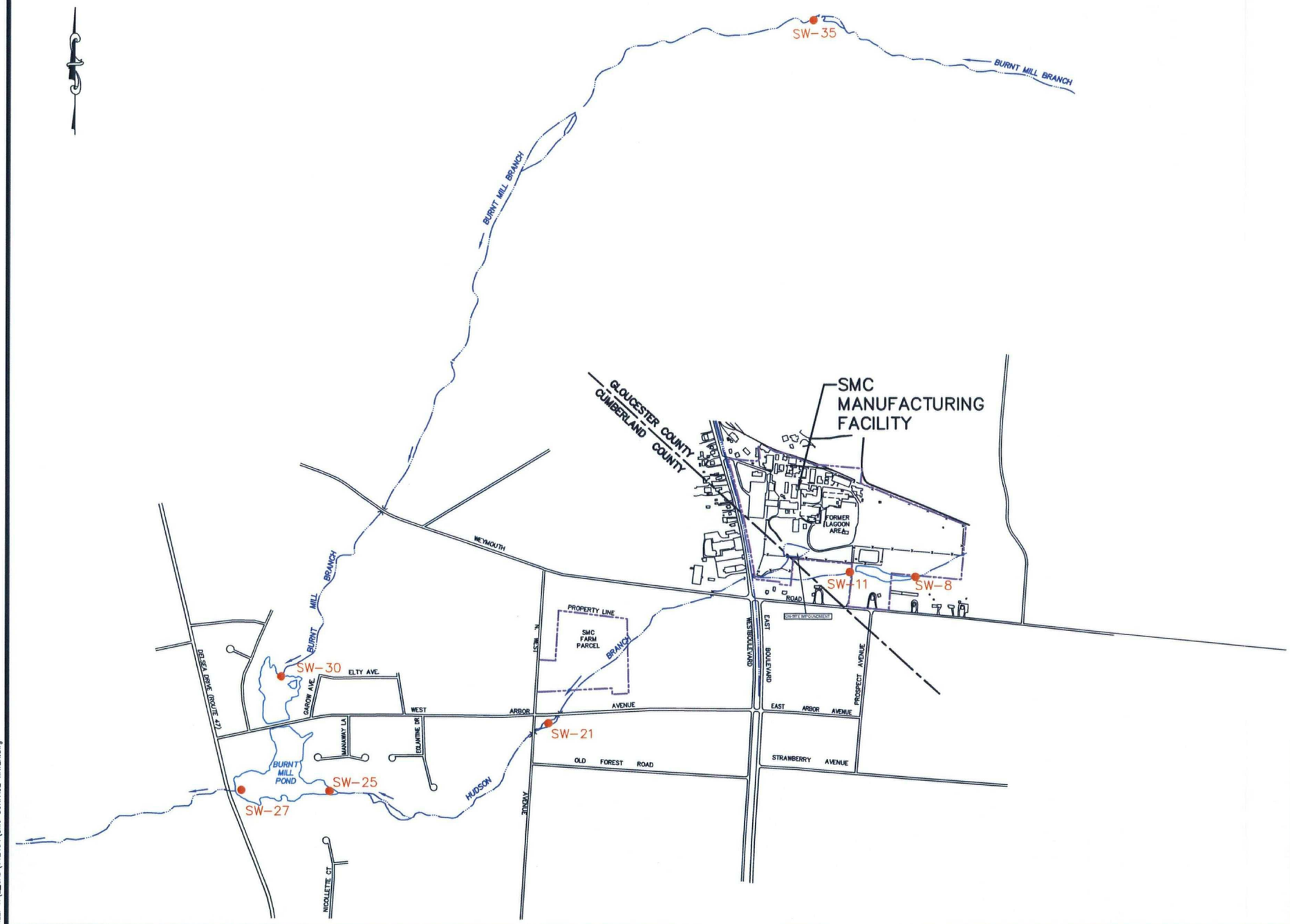
J:\CAD\112434\00SEDI\002690\
Figure 2-3.dwg Layout:Figure 2-3 May 18, 2011-3:14PM KHollenbeck

TRC
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SHIRLALLOY METALLUGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE 2-3
SMC FACILITY TERRESTRIAL HABITATS

Date: 05/11 | **Project No.** 112434-00SEDI-002690



LEGEND:

PROPERTY LINE

SW-35 SURFACE WATER SAMPLE LOCATION

NOTE:

DRAWING BASED ON "SHIELDALLOY METALLURGICAL CORPORATION, SMC FACILITY, NEWFIELD, NJ, SURFACE WATER RESULTS" BY TRC CORPORATION OF MILBURN, NEW JERSEY DATED JANUARY 2011.

APPROXIMATE GRAPHIC SCALE

0' 600' 1200' 2400'

SHIELDALLOY METALLURGICAL CORPORATION
(SMC)
NEWFIELD, NEW JERSEY

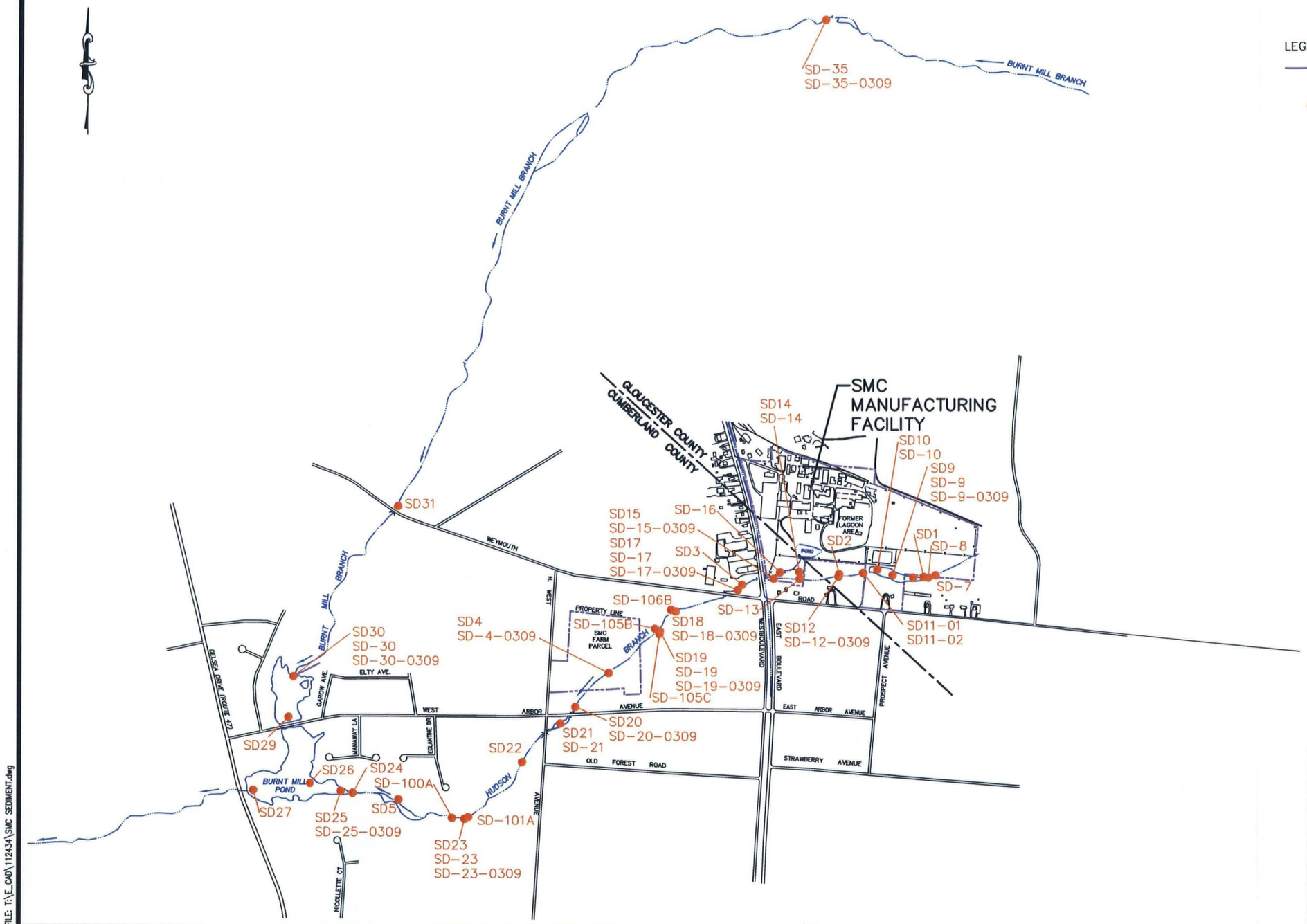
SURFACE WATER SAMPLING LOCATIONS

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

DRAWN BY: HWB
CHECKED BY: SH
DATE: MAY 2011

FIGURE 2-4

FILE: T:\E_CAD\112434\SMC SURFACE WATER.dwg



LEGEND:

PROPERTY LINE

SD9
SD-9
SD-9-0309
SEDIMENT SAMPLE LOCATION

NOTE:

DRAWING BASED ON "SHIELDALLOY METALLURGICAL CORPORATION, SMC FACILITY, NEWFIELD, NJ, METAL SEDIMENT SAMPLING RESULTS" BY TRC CORPORATION OF MILBURN, NEW JERSEY DATED MAY 2011.

APPROXIMATE GRAPHIC SCALE

0' 600' 1200' 2400'

SHIELDALLOY METALLURGICAL CORPORATION
(SMC)
NEWFIELD, NEW JERSEY

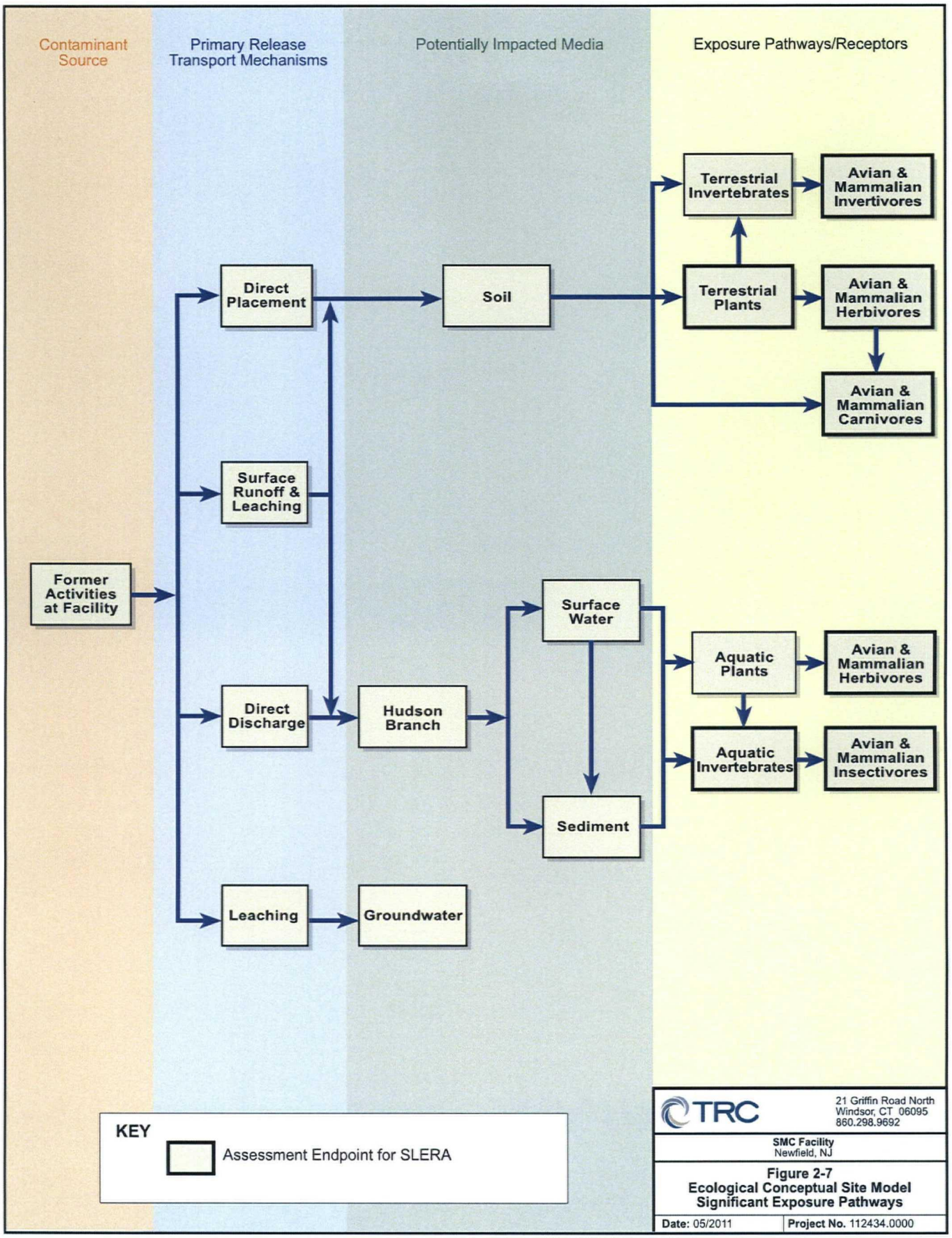
SEDIMENT SAMPLING LOCATIONS

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

DRAWN BY: HWB
CHECKED BY: SH
DATE: MAY 2011

FIGURE 2-5

FILE: T:\E_CAD\112434\SMC SEDIMENT.dwg


Contaminant Source
Primary Release Transport Mechanisms
Potentially Impacted Media
Exposure Pathways/Receptors
Former Activities at Facility
Direct Placement
Surface Runoff & Leaching
Direct Discharge
Leaching
Soil
Hudson Branch
Groundwater
Surface Water
Sediment
Terrestrial Invertebrates
Terrestrial Plants
Aquatic Plants
Aquatic Invertebrates
Avian & Mammalian Invertivores
Avian & Mammalian Herbivores
Avian & Mammalian Carnivores
Avian & Mammalian Herbivores
Avian & Mammalian Insectivores
KEY
Assessment Endpoint for SLERA
TRC
21 Griffin Road North
Windsor, CT 06095
860.298.9692
SMC Facility
Newfield, NJ
Figure 2-7
Ecological Conceptual Site Model
Significant Exposure Pathways
Date: 05/2011
Project No. 112434.0000

APPENDIX A
LABORATORY ANALYTICAL RESULTS

Table A-1
Analytical Results for Surface Water Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

Analysis	Sample ID:	SW-8	SW-11		SW-21	SW-25	SW-27
	Date:	8/10/1995	8/10/1995	8/10/1995 Field Dup	8/10/1995	8/9/1995	8/9/1995
Metals, total							
(ug/L)	Aluminum	**979**	**1,770**	**227**	**169**	**2,310**	**286**
	Arsenic	**3.2**	**1.8** U	**1.8** U	**1.8** U	**2.8**	**1.8** U
	Barium	**34**	**53.3**	**21.1**	**40.4**	**87.1**	**119**
	Beryllium	**0.70** U	**0.70** U	**0.70** U	**1.0**	**2.6**	**1.0**
	Calcium	**3,650**	**4,250**	**4,200**	**5,180**	**4,660**	**5,220**
	Chromium	**101**	**47.6**	**23**	**19.6**	**46.8**	**38.7**
	Cobalt	**2.9** U	**4.9**	**2.9** U	**2.9** U	**10.1**	**7.4**
	Copper	**23.2**	**17.6**	**13.5**	**6.2**	**7.9**	**6.0**
	Iron	**655**	**1,710**	**143**	**150**	**3,080**	**374**
	Lead	**2.9**	**0.70** U	**0.70** U	**0.70** U	**2.7**	**3.4**
	Magnesium	**3,210**	**7,770**	**3,620**	**3,860**	**8,670**	**2,620**
	Manganese	**42.3**	**42.3**	**28.2**	**9.4**	**88**	**194**
	Nickel	**10.2**	**12.3**	**6.8** U	**6.8** U	**19.2**	**8.1**
	Potassium	**18,600**	**21,000**	**22,700**	**15,800**	**8,960**	**4,890**
	Selenium	**4.4**	**1.2** U	**1.2** U	**1.2** U	**1.7**	**1.5** U
	Sodium	**177,000**	**196,000**	**215,000**	**150,000**	**44,600**	**15,000**
	Vanadium	**64.3**	**33**	**33.9**	**257**	**413**	**145**
	Zinc	**287**	**54.1**	**54.3**	**47.5**	**24.6**	**55.1**
General Chemistry							
(ug/L)	Hardness	**21,600**	**22,500**	**22,500**	NA	**23,500**	**29,400**

Notes:

ug/L - micrograms per liter.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Table A-2
Analytical Results for Surface Water Samples -- Reference Area
SMC Facility
Newfield, New Jersey

	Sample ID:	SW-30	SW-31
	Date:	8/9/1995	8/9/1995
Metals, total			
(ug/L)	Aluminum	**163**	**127**
	Barium	**174**	**162**
	Calcium	**8,960**	**8,330**
	Cobalt	**6.3**	**7.9**
	Copper	**2.7**	**3.3**
	Iron	**301**	**259**
	Lead	**0.90**	**0.90**
	Magnesium	**4,440**	**4,160**
	Manganese	**180**	**271**
	Nickel	**6.9** U	**10.5**
	Potassium	**3,080**	**2,600**
	Sodium	**6,390**	**5,970**
	Zinc	**77.6**	**85.9**
General Chemistry			
(ug/L)	Hardness	**38,300**	**37,400**

Notes:
ug/L - micrograms per liter.
U - Compound was not detected at specified quantitation limit.
Values in Bold indicate the compound was detected.

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD1-01	SD2-01	SD3-01		SD4-01	SD-04-0309-	SD5-01	SD7-01	SD8-01	SD9-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	10/31/1990	10/31/1990	10/31/1990	10/31/1990 Field Dup	10/31/1990	3/18/2009	10/31/1990	8/9/1995	8/10/1995	8/11/1995
VOCs											
(mg/kg)	1,2-Dichloroethene (Total)	0.012 U	0.070 U	0.002 J	0.008 U	0.00S J	NA	0.017 U	NA	NA	NA
	2-Butanone	0.072	0.130 J	0.120	0.051	0.055	NA	0.069	NA	NA	NA
	Acetone	0.330 B	0.430 B	0.360 B	0.190 B	0.290 B	NA	0.220 B	NA	NA	NA
	Carbon Disulfide	0.012 U	0.070 U	0.009 U	0.008 U	0.012 U	NA	0.004 J	NA	NA	NA
	Methylene Chloride	0.100 B	0.870 B	0.110 B	0.075 B	0.098 B	NA	0.130 B	NA	NA	NA
	Trichloroethene	0.012 U	0.070 U	0.009 U	0.008 U	0.012 U	NA	0.007 J	NA	NA	NA
SVOCs											
(mg/kg)	Benzo(b)fluoranthene	0.980 U	NA	NA	NA	0.110 J	NA	NA	NA	NA	NA
	Benzoic acid	1.000 J	NA	NA	NA	3.200 J	NA	NA	NA	NA	NA
	bis(2-ethylhexyl)phthalate	0.580 J	NA	NA	NA	0.270 J	NA	NA	NA	NA	NA
	Butyl benzyl phthalate	0.140 J	NA	NA	NA	0.900 U	NA	NA	NA	NA	NA
	Chrysene	0.980 U	NA	NA	NA	0.140 J	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	0.490 JB	NA	NA	NA	0.580 JB	NA	NA	NA	NA	NA
	Fluoranthene	0.120 J	NA	NA	NA	0.210 J	NA	NA	NA	NA	NA
	Pentachlorophenol	0.330 J	NA	NA	NA	4.500 U	NA	NA	NA	NA	NA
	Phenanthrene	0.980 U	NA	NA	NA	0.110 J	NA	NA	NA	NA	NA
	Phenol	0.100 J	NA	NA	NA	0.520 J	NA	NA	NA	NA	NA
	Pyrene	0.980 U	NA	NA	NA	0.130 J	NA	NA	NA	NA	NA
PCBs											
(mg/kg)	Aroclor-1248	0.210 U	NA	NA	NA	0.190 U	NA	NA	NA	NA	NA
	Aroclor-1254	0.160 J	NA	NA	NA	0.095 J	NA	NA	NA	NA	NA
	Aroclor-1260	0.420 U	NA	NA	NA	0.390 U	NA	NA	NA	NA	NA
Pesticides											
(mg/kg)	4,4'-DDD	0.0053 J	NA	NA	NA	0.018 J	NA	NA	NA	NA	NA
	4,4'-DDE	0.018 J	NA	NA	NA	0.011 J	NA	NA	NA	NA	NA
	4,4'-DDT	0.033 J	NA	NA	NA	0.028 J	NA	NA	NA	NA	NA
Metals, total											
(mg/kg)	Aluminum	13,500	26,500	5,070	4,520	6,780	NA	9,750	5,170	5,350	9,340
	Antimony	10.4 U	270	36.3	29.7	28.7	NA	35.8 D	3.7 U	31.8	29.6
	Arsenic	5.1	16.1 D	12.3	11.2	8.4	3.3 J	9.8	0.46	1.0	4.6
	Barium	129	408 D	146	139	194	NA	307	83.7	190	163
	Beryllium	9.1	22.8	S.9	5.2	3.8	NA	5.6	1.0	1.4	1.8
	Cadmium	1.9 U	9.5 U	1.4 U	1.4 U	1.7 U	0.51 UJ	2.6 U	0.60	0.66 U	0.89 U
	Calcium	2,960	3,790 D	1,210 D	1,060 D	1,500 D	NA	3,470	1,180	2,540	2,630
	Chromium	1,220	15,700	1,950	1,780	1,770	657 J	2,350	150	628	1,400
	Cobalt	6.0 D	45.3 D	16.5 D	14.8 D	14.2 D	NA	21.3 D	2.5	4.8	5.6
	Copper	25.3	327	93.0	71.1	149	32.6 J	65.8	6.1	46.2	34.3
	Iron	13,600	17,800	8,500	7,450	8,300	6,380 J	10,400	4,310	4,470	7,280
	Lead	364	338	104	77.4	51.8	34.6 J	69.8	109	46.9	97.7

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD1-01	SD2-01	SD3-01		SD4-01	SD-04-0309-	SD5-01	SD7-01	SD8-01	SD9-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	10/31/1990	10/31/1990	10/31/1990	10/31/1990 Field Dup	10/31/1990	3/18/2009	10/31/1990	8/9/1995	8/10/1995	8/11/1995
	Magnesium	868 D	1,300 D	507 D	438 D	447 D	NA	745 D	1,050	917	935
	Manganese	238	227	227	205	336	238 J	655	210	109	248
	Mercury	0.20 U	2.2	0.16	0.61	0.88	0.21 J	1.1	0.07 U	0.16	0.14
	Nickel	64.1	423	257	205	135	49.7 J	96.5	24.0	80.9	57.1
	Potassium	597 D	2,170 U	471 D	357 D	382 U	NA	595 U	333	234	663
	Selenium	4.4	5.2 U	0.69 U	0.67 U	1.1 D	NA	1.9 D	0.83	0.93	2.0
	Silver	1.9 U	9.5 U	1.4 U	1.4 U	1.7 U	NA	2.6 U	0.34 U	0.57 U	1.7 U
	Sodium	199 D	860 D	553 D	556 D	257 D	NA	554 D	136	846	1,290
	Thallium	2.0 U	10.3 U	1.4 U	1.3 U	1.7 U	NA	2.6 U	0.27 U	0.45 U	0.58 U
	Vanadium	1,890	4,850	1,160	997	647	NA	800	137	1S0	781
	Zinc	231	529	164	139	115	57.7 J	175	47.6	125	101
Total Organic Carbon (mg/kg)	Total Organic Carbon	NA	NA	NA	NA	NA	43,400 J	NA	33,900	65,200	86,900

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD-9A	SD9A-01	SD-9A-309-A	SD10-01		SD-10	SDii-0i	SD11-02	SD12-01	SD-12-0309-
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	9/25/1995	8/11/1995	3/19/2009	8/11/1995	8/11/1995 Field Dup	9/25/1995	8/10/1995	8/10/1995	8/11/1995	3/19/2009
VOCs											
(mg/kg)	1,2-Dichloroethene (Total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
(mg/kg)	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzoic acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs											
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	0.230 U	NA	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	0.250	NA	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NR	NA	NA	NA
Pesticides											
(mg/kg)	4,4'-DDD	NA	NA	NA	NA	NA	NA	0.023 U	NA	NA	NA
	4,4'-DDE	NA	NA	NA	NA	NA	NA	0.023 U	NA	NA	NA
	4,4'-DDT	NA	NA	NA	NA	NA	NA	0.023 U	NA	NA	NA
Metals, total											
(mg/kg)	Aluminum	20,800	10,500	NA	21,500	21,900	29,900	15,800	20,400	24,100	NA
	Antimony	60.5	78.4	NA	96.0	44.6	122	48.8	56.6	170	NA
	Arsenic	14.5	7.3	5.5 J	8.2	11.2	24.8	16.3	2S.6	23.8	7.1 J
	Barium	449	323	NA	390	399	462	165	239	288	NA
	Beryllium	8.6	2.4	NA	4.0	22.0	14.6	8.2	10.8	3.5	NA
	Cadmium	1.9 U	1.6 U	1.2 J	3.1	2.0	2.3	2.4	3.9	3.5 U	0.52 UJ
	Calcium	3,870	3,720	NA	2,790	2,570	3,170	1,830	2,540	2,380	NA
	Chromium	5,130	4,600	5,440 J	5,360	5,610	7,620	4,040	5,270	9,740	2,960 J
	Cobalt	21.7	14.4	NA	36.0	34.2	36.4	16.4	23.9	19.5	NA
	Copper	95.8	101	80.4 J	230	231	241	361	611	361	148 J
	Iron	27,600	15,900	16,700 J	40,500	40,000	40,800	19,500	27,600	30,500	14,600 J
	Lead	222	117	124 J	336	537	381	148	212	280	108 J

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD-9A	SD9A-01	SD-9A-309-A	SD10-01		SD-10	SD11-01	SD11-02	SD12-01	SD-12-0309-
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	9/25/1995	8/11/1995	3/19/2009	8/11/1995	8/11/1995 Field Dup	9/25/1995	8/10/1995	8/10/1995	8/11/1995	3/19/2009
	Magnesium	1,890	1,590	NA	1,960	2,110	2,440	1,510	2,070	1,590	NA
	Manganese	498	362	153 J	731	682	696	387	661	401	48.7 J
	Mercury	0.54	0.26 U	0.31 J	0.81	1.1	1.4	1.2	1.3	1.9	1.5 J
	Nickel	168	131	114 J	559	566	472	256	346	199	58.6 J
	Potassium	1,960	896	NA	922	973	1,930	465	776	1,290 U	NA
	Selenium	1.9	1.8	NA	1.3	1.5	1.00	3.4	7.2	5.3	NA
	Silver	1.5 U	3.1 U	NA	4.3 U	2.1 U	1.1 U	1.7 U	2.0 U	6.7 U	NA
	Sodium	2,970	2,610	NA	1,240	1,140	1,990	1,830	2,230	3,370	NA
	Thallium	1.2 U	1.0 U	NA	0.72 U	0.70 U	1.1	1.4 U	1.6 U	2.2 U	NA
	Vanadium	1,620	1,050	NA	3,530	3,380	3,030	1,330	1,670	2,720	NA
	Zinc	310	241	231 J	513	512	574	468	615	374	81.8 J
Total Organic Carbon (mg/kg)	Total Organic Carbon	188,000	259,000	158,000 J	29,900	53,800	66,400	63,500	82,900	118,000	69,300 J

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture pf Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD-36-0309-	SD13-01	SD14-01	SD-14	SD15-01	SD-15-0309-	SD16-01	SD17-01	SD-17	SD-17-0309-
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	3/19/2009 Field Dup	8/10/1995	8/10/1995	9/26/1995	8/10/1995	3/19/2009	8/10/1995	8/10/1995	9/26/1995	3/18/2009
VOCs											
(mg/kg)	1,2-Dichloroethene (Total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
(mg/kg)	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzoic acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs											
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	1.300	NA	NA	NA	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NR	NA	NA	NA	NA	NA
	Aroclor-1260	NA	NA	NA	NA	0.590	NA	NA	NA	NA	NA
Pesticides											
(mg/kg)	4,4'-DDD	NA	NA	NA	NA	0.046 U	NA	NA	NA	NA	NA
	4,4'-DDE	NA	NA	NA	NA	0.046 U	NA	NA	NA	NA	NA
	4,4'-DDT	NA	NA	NA	NA	0.046 U	NA	NA	NA	NA	NA
Metals, total											
(mg/kg)	Aluminum	NA	26,700	22,700	23,400	6,800	NA	17,000	8,360	18,700	NA
	Antimony	NA	77.8	86.5	91.6	7.5 U	NA	70.8	54.3	147	NA
	Arsenic	7.5 J	14.6	18.7	30.7	16.1	8.0 J	11.6	12.6	49.3	15.6 J
	Barium	NA	506	334	405	228	NA	425	262	349	NA
	Beryllium	NA	13.2	6.0	9.4	21.1	NA	11.7	4.6	7.5	NA
	Cadmium	0.50 UJ	1.6 U	1.6 U	3.6	0.80 U	0.51 UJ	1.8 U	0.93 U	2.4	0.59 J
	Calcium	NA	2,830	3,400	3,300	918	NA	5,070	2,460	3,320	NA
	Chromium	2,710 J	8,050	8,190	6,700	2,100	698 J	6,730	5,760	8,500	3,150 J
	Cobalt	NA	25.4	21.2	28.3	30.6	NA	21.2	27.2	39.5	NA
	Copper	143 J	244	185	249	276	85.8 J	335	123	163	147 J
	Iron	14,400 J	33,500	22,700	29,100	14,500	17,700 J	12,900	18,300	32,400	16,700 J
	Lead	109 J	208	144	264	140	85.5 J	149	133	320	156.0 J

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD-36-0309-	SD13-01	SD14-01	SD-14	SD15-01	SD-15-0309-	SD16-01	SD17-01	SD-17	SD-17-0309-
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	3/19/2009 Field Dup	8/10/1995	8/10/1995	9/26/1995	8/10/1995	3/19/2009	8/10/1995	8/10/1995	9/26/1995	3/18/2009
	Magnesium	NA	1,770	1,740	1,650	1,250	NA	1,820	1,540	2,220	NA
	Manganese	47.6 J	286	265	296	141	272 J	1,200	977	1,030	291 J
	Mercury	1.2 J	1.6	1.2	1.2	0.89	0.48 J	0.46	0.45	0.56	0.63 J
	Nickel	54.1 J	142	124	222	1,090	218 J	552	428	655	356 J
	Potassium	NA	1,150	705	1,110	158 U	NA	522	630	1,730	NA
	Selenium	NA	1.4	1.6	3.8	1.3	NA	0.73 U	0.39 U	1.3	NA
	Silver	NA	1.4 U	1.4 U	2.7 U	0.69 U	NA	1.5 U	0.80 U	1.6 U	NA
	Sodium	NA	2,250	2,350	2,410	794	NA	778	1,110	2,910	NA
	Thallium	NA	1.1 U	1.1 U	0.80 U	0.55 U	NA	1.2 U	0.64 U	0.48 U	NA
	Vanadium	NA	2,010	710	1,740	3,680	NA	1,740	658	1,330	NA
	Zinc	76.6 J	316	216	350	374	128 J	484	315	427	192 J
Total Organic Carbon (mg/kg)	Total Organic Carbon	90,600 J	90,900	196,000	230,000	76,800	60,900 J	111,000	90,100	120,000	60,900 J

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD18-01	SD-18-0309-	SD19-01	SD-19	SD-19-0309-	SD20-01	SD-20-0309-	SD21-01	SD21-02	SD22-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.25	0.25-0.75	0-0.5
	Date:	8/10/1995	3/18/2009	8/10/1995	9/26/1995	3/18/2009	8/10/1995	3/18/2009	8/10/1995	8/10/1995	8/10/1995
VOCs											
(mg/kg)	1,2-Dichloroethene (Total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
(mg/kg)	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzoic acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs											
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	0.140 U	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	0.140 U	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	0.140 U	NA	NA
Pesticides											
(mg/kg)	4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	0.074	NA	NA
	4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	0.046	NA	NA
	4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	0.051	NA	NA
Metals, total											
(mg/kg)	Aluminum	15,500	NA	18,300	32,700	NA	5,340	NA	24,000	1,420	3,730
	Antimony	41.1	NA	25.0	107	NA	6.6	NA	56.3	3.1 UJ	41.0
	Arsenic	7.5	27.5 J	24.6	77.6	2.4 J	2.3	2.2 J	22.1	0.48	7.6
	Barium	121	NA	444	688	NA	129	NA	473	17.1	146
	Beryllium	5.4	NA	16.3	22.6	NA	1.3	NA	6.4	0.25	2.2
	Cadmium	1.2 U	2.6 UJ	1.7 U	2.9	0.51 UJ	0.55 U	0.54 UJ	1.3 U	0.33 U	0.81 U
	Calcium	1,270	NA	3,190	5,110	NA	1,450	NA	3,760	169	2,060
	Chromium	3,620	6,160 J	4,060	7,630	388 J	736	344 J	5,820	133	1,360
	Cobalt	18.9	NA	47.3	67.3	NA	5.2	NA	27.6	0.80	7.6
	Copper	112	230 J	181	323	22.9 J	15.7	23.3 J	196	5.8	41.3
	Iron	17,200	24,200 J	27,000	43,500	3,660 J	3,770	4,610 J	27,300	1,110	5,670
	Lead	143	177 J	147	266	25.8 J	21.3	19.9 J	174	4.2	44.2

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD18-01	SD-18-0309-	SD19-01	SD-19	SD-19-0309-	SD20-01	SD-20-0309-	SD21-01	SD21-02	SD22-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.25	0.25-0.75	0-0.5
	Date:	8/10/1995	3/18/2009	8/10/1995	9/26/1995	3/18/2009	8/10/1995	3/18/2009	8/10/1995	8/10/1995	8/10/1995
	Magnesium	896	NA	1,230	2,220	NA	509	NA	1,500	91.2	375
	Manganese	125	460 J	1,160	1,210	173 J	273	179 J	928	28.8	436
	Mercury	8.3	2.5 J	1.4	4.4	0.14 J	0.21	0.32 J	1.3	0.06 U	0.24
	Nickel	210	332 J	572	959	52.7 J	22.0	39.4 J	122	6.3	57.0
	Potassium	813	NA	366	1,650	NA	278	NA	465	65.6 U	158 U
	Selenium	0.52 U	NA	2.3	3.4	NA	0.29	NA	0.61	0.14 U	0.33 U
	Silver	1.1 U	NA	1.5 U	3.9	NA	0.48 U	NA	1.1 U	0.29 U	0.69 U
	Sodium	1,280	NA	1,900	2,450	NA	767	NA	1,090	122	681
	Thallium	0.86 U	NA	1.2 U	0.84 U	NA	0.38 U	NA	0.87 U	0.23 U	0.56 U
	Vanadium	753	NA	2,690	4,870	NA	122	NA	791	38.7	283
	Zinc	117	258 J	427	767	39.1 J	32.6	41.9 J	249	9.9	90.1
Total Organic Carbon (mg/kg)	Total Organic Carbon	80,400	119,000 J	33,800	155,000	65,000 J	64,800	86,700 J	226,000	19,700	43,600

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD23-01	SD-23	SD-23-0309-	SD24-01	SD25-01	SD-25-0309-	SD26-01	SD27-01	SD-100A	SD-101A
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	8/10/1995	9/26/1995	3/18/2009	8/9/1995	8/9/1995	3/18/2009	8/9/1995	8/9/1995	4/11/1996	4/11/1996
VOCs											
(mg/kg)	1,2-Dichloroethene (Total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
(mg/kg)	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzoic acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs											
(mg/kg)	Aroclor-1248	NA	NA	NA	0.059 U	NA	NA	NA	NA	NA	NA
	Aroclor-1254	NA	NA	NA	0.059 U	NA	NA	NA	NA	NA	NA
	Aroclor-1260	NA	NA	NA	0.059 U	NA	NA	NA	NA	NA	NA
Pesticides											
(mg/kg)	4,4'-DDD	NA	NA	NA	0.0059 U	NA	NA	NA	NA	NA	NA
	4,4'-DDE	NA	NA	NA	0.0059 U	NA	NA	NA	NA	NA	NA
	4,4'-DDT	NA	NA	NA	0.0059 U	NA	NA	NA	NA	NA	NA
Metals, total											
(mg/kg)	Aluminum	10,800	11,900	NA	667	729	NA	276	430	NA	NA
	Antimony	33.7	72.0	NA	4.8 U	8.2	NA	4.7 U	4.8 U	NA	NA
	Arsenic	11.8	22.4	4.4 J	1.1	1.7	3.0 J	0.36	0.39	NA	NA
	Barium	273	284	NA	47.8	68.8	NA	32.9	14.2	NA	NA
	Beryllium	4.9	3.1	NA	0.34	0.76	NA	0.21	0.18	NA	NA
	Cadmium	1.6	1.6	0.54 UJ	0.54 U	0.83 U	0.51 UJ	0.54 U	0.55 U	NA	NA
	Calcium	3,410	3,140	NA	990	1,360	NA	607	171	NA	NA
	Chromium	3,500	2,880	418 J	83.4	340	594 J	110	72.4	415	3,220
	Cobalt	13.9	20.9	NA	1.5	2.7	NA	1.6	3.7	NA	NA
	Copper	75.9	73.0	22.3 J	2.4	4.8	13.2 J	1.8	1.8	12.1	39.1
	Iron	13,600	14,600	6,290 J	952	961	3,830 J	448	486	NA	NA
	Lead	68.2	84.7	35.5 J	5.4	5.3	29.1 J	4.4	5.8	NA	NA

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD23-01	SD-23	SD-23-0309-	SD24-01	SD25-01	SD-25-0309-	SD26-01	SD27-01	SD-100A	SD-101A
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	8/10/1995	9/26/1995	3/18/2009	8/9/1995	8/9/1995	3/18/2009	8/9/1995	8/9/1995	4/11/1996	4/11/1996
	Magnesium	948	1,020	NA	181	289	NA	138	43.7	NA	NA
	Manganese	370	465	85.7 J	147	92.5	224 J	S6.9	16.6	NA	NA
	Mercury	0.43	0.32	0.13 J	0.09 U	0.20	0.15 J	0.09 U	0.09 U	NA	NA
	Nickel	108	95.6	18.1 J	3.3	10.3	22.4 J	2.7	1.9	41.2	46.6
	Potassium	214	579	NA	113	281	NA	70.1	175	NA	NA
	Selenium	0.42 U	1.8	NA	0.44	0.62	NA	0.26 U	0.27 U	NA	NA
	Silver	0.88 U	2.0 U	NA	0.44 U	0.67 U	NA	0.43 U	0.45 U	NA	NA
	Sodium	1,420	1,510	NA	265	296	NA	140	89.1	NA	NA
	Thallium	0.70 U	0.59 U	NA	0.35 U	0.54 U	NA	0.35 U	0.36 U	NA	NA
	Vanadium	658	479	NA	36.7	91.9	NA	32.2	15.2	136	396
	Zinc	131	187	63.8 J	8.3	10.9	56.5 J	5.9	7.6	NA	NA
Total Organic Carbon (mg/kg)	Total Organic Carbon	107,000	121,000	66,000 J	12,600	400,000	70,900 J	4,520	3,530	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facilily
Newfield, New Jersey

	Sample ID:	SD-105B	SD-105C	SD-106B
	Depth (ft.):	0-0.5	0-0.5	0-0.5
	Date:	4/11/1996	4/11/1996	4/11/1996
VOCs				
(mg/kg)	1,2-Dichloroethene (Total)	NA	NA	NA
	2-Butanone	NA	NA	NA
	Acetone	NA	NA	NA
	Carbon Disulfide	NA	NA	NA
	Methylene Chlbride	NA	NA	NA
	Trichloroethene	NA	NA	NA
SVOCs				
(mg/kg)	Benzo(b)fluoranthene	NA	NA	NA
	Benzoic acid	NA	NA	NA
	bis(2-ethylhexyl)phthalate	NA	NA	NA
	Butyl benzyl phthalate	NA	NA	NA
	Chrysene	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA
	Fluoranthene	NA	NA	NA
	Pentachlorophenol	NA	NA	NA
	Phenanthrene	NA	NA	NA
	Phenol	NA	NA	NA
	Pyrene	NA	NA	NA
PCBs				
(mg/kg)	Aroclor-1248	NA	NA	NA
	Aroclor-1254	NA	NA	NA
	Aroclor-1260	NA	NA	NA
Pesticides				
(mg/kg)	4,4'-DDD	NA	NA	NA
	4,4'-DDE	NA	NA	NA
	4,4'-DDT	NA	NA	NA
Metals, total				
(mg/kg)	Aluminum	NA	NA	NA
	Antimony	NA	NA	NA
	Arsenic	NA	NA	NA
	Barium	NA	NA	NA
	Beryllium	NA	NA	NA
	Cadmium	NA	NA	NA
	Calcium	NA	NA	NA
	Chromium	3,410	3,460	2,720
	Cobalt	NA	NA	NA
	Copper	73.7	82.3	178
	Iron	NA	NA	NA
	Lead	NA	NA	NA

Table A-3
Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Sample ID:	SD-105B	SD-105C	SD-106B
	Depth (ft.):	0-0.5	0-0.5	0-0.5
	Date:	4/11/1996	4/11/1996	4/11/1996
	Magnesium	NA	NA	NA
	Manganese	NA	NA	NA
	Mercury	NA	NA	NA
	Nickel	**243**	**175**	**371**
	Potassium	NA	NA	NA
	Selenium	NA	NA	NA
	Silver	NA	NA	NA
	Sodium	NA	NA	NA
	Thallium	NA	NA	NA
	Vanadium	**3,130**	**4,110**	**1,820**
	Zinc	NA	NA	NA
Total Organic Carbon (mg/kg)	Total Organic Carbon	NA	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-4
Analytical Results for Sediment Samples -- Reference Area
SMC Facility
Newfield, New Jersey

	Sample ID:	SD29-01	SD30-0i	SD-30	SD-30-0309-A	SD31-01	SD-35	SD-35-0309-A
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	8/9/1995	8/9/1995	9/25/1995	3/18/2009	8/10/1995	9/26/1995	3/19/2009
Metals, total								
(mg/kg)	Aluminum	**3,860**	**4,320**	**4,220**	NA	**1,070**	**3,900**	NA
	Arsenic	**1.2**	**2.0**	**2.7**	**10 UJ**	**0.27 U**	**1.5**	**10 UJ**
	Barium	**39.0**	**236**	**198**	NA	**25.3**	**82.7**	NA
	Beryllium	**0.18**	**1.6**	**1.6**	NA	**0.18**	**0.66 U**	NA
	Cadmium	**0.38 U**	**2.1**	**1.2 U**	**2.6 UJ**	**0.43 U**	**1.5 U**	**2.6 UJ**
	Calcium	**245**	**3,090**	**2,420**	NA	**331**	**908**	NA
	Chromium	**4.4**	**6.8**	**5.9**	**7.8 J**	**1.6**	**7.5**	**38.3 J**
	Cobalt	**3.8**	**31.7**	**28.1**	NA	**8.9**	**5.8**	NA
	Copper	**2.0**	**9.6**	**6.2**	**13 UJ**	**1.3**	**6.6**	**28.3 J**
	Iron	**3,310**	**4,210**	**4,770**	**5,620 J**	**590**	**2,470**	**15,000 J**
	Lead	**11.6**	**58.5**	**35.8**	**56.3 J**	**4.0**	**25.8**	
	Magnesium	**241**	**705**	**539**	NA	**93.6**	**324**	NA
	Manganese	**41.3**	**271**	**328**	**406 J**	**91.4**	**35.4**	**66.9 J**
	Mercury	**0.06 U**	**1.3**	**1.2**	**0.70 J**	**0.07**	**0.92**	**1.5 J**
	Nickel	**2.4**	**16.2**	**12.8**	**21 UJ**	**2.6**	**6.5 U**	**22.3 J**
	Potassium	**201**	**385**	**226 U**	NA	**84.4 U**	**374 U**	NA
	Selenium	**0.27**	**0.68 U**	**0.99**	NA	**0.18 U**	**1.6**	NA
	Sodium	**56.8**	**192**	**186**	NA	**70.5**	**128**	NA
	Vanadium	**7.2**	**10.9**	**7.8**	NA	**1.4**	**7.0**	NA
	Zinc	**8.7**	**68.7**	**39.9**	**78.6 J**	**10.6**	**11.3**	**87.6 J**
Total Organic Carbon								
(mg/kg)	Total Organic Carbon	**3,710**	**93,300**	**211,000**	**213,000 J**	**7,080**	**187,000**	**248,000 J**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

J - Estimated value; detected below quantitation limit.

NA - Sample not analyzed for the listed analyte.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in Bold indicate the compound was detected.

Table A-5
Analytical Results for Surface Soil Samples - Former Lagoon Area
SMC Facility
Newfield, New Jersey

	Sample ID:	RA17-01	RA22-01	SB55-01	SB61-01	SB62-01	SB63-01	SB64-01	SB82-01	SB83-01
	Depth (ft.):	0-0.5	0-0.5	0-2	0-2	0-2	0-2	0-2	0-2	0-2
	Date:	10/30/1990	10/30/1990	11/7/1990	11/9/1990	11/14/1990	11/14/1990	11/14/1990	11/9/1990	11/9/1990
Metals, total										
(mg/kg)	Aluminum	4,340	3,740	8,610	5,250	3,940	2,440	5,070	3,320	4,660
	Antimony	10.1 U	12.5 U	4.5 U	13.1 U	12.1 U	12.9 U	12.2 U	6.5 D	12.7 U
	Arsenic	2.1	1.3 D	0.74 D	0.83 D	0.42 D	0.66 D	2.1 U	1.5 D	1.4 D
	Barium	8.6 D	26.8 D	36.2 D	22.9 D	12.9 D	17.5 D	15.5 D	15.4 D	29.9 D
	Beryllium	0.40 D	3.3	3.5	0.31 D	0.42 D	0.30 D	0.35 D	0.32 D	0.51 D
	Calcium	127 D	1,440	1,890	84.3 D	94.9 D	597 D	86.6 D	235 D	618 D
	Chromium	18.7	51.4	0.9	33.0	50.7	17.0	2.3	10.9	35.5
	Chromium (VI)	0.12	0.30	R	R	0.11 U	0.11 U	0.11 U	R	R
	Cobalt	1.3 D	2.1 D	8.2 D	3.3 D	1.5 D	10.8 U	2.2 D	10.7 U	2.0 D
	Copper	1.4 D	10.9	91.3 D	4.9 D	1.9 D	3.8 D	1.8 D	2.5 D	5.4
	Iron	9,230	4,650	23,200	12,000	7,270	2,780	11,500	3,720	8,300
	Lead	6.4	12.0	9.0 D	10.7	6.4	12.8	4.3	13.0	14.7
	Magnesium	168 D	1,090	1,460 D	271 D	155 D	252 D	226 D	311 D	415 D
	Manganese	21.7	408	371	78.9	48.4	133	30.3	51.1	118
	Nickel	5.1 D	91.5	179	10.9	5.1 D	6.2 D	3.7 D	5.4 D	11.7
	Potassium	840 U	180 D	185 U	405 D	1,010 U	318 D	1,020 U	349 D	307 D
	Selenium	0.92 U	0.96 U	0.42 U	1.1 U	1.0 U	1.1 U	0.42 D	1.1 U	1.1 U
	Sodium	34.8 D	434 D	188 D	210 D	1,010 U	38.6 D	1,020 U	75.3 D	59.8 D
	Titanium	57.8	128	NA	NA	NA	NA	NA	NA	NA
	Vanadium	34.4	654	671	29.4	55.4	51.4	29.5	68.3	91.2
	Zinc	18.4	28.0	48.9	17.3	11.2	17.2	3.8 D	9.6	21.0

Notes:

mg/kg - miiligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

ND - Not detected.

R - Rejected during data review.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Table A-6
Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Sample ID:	RA27-01	RA28-01	RA29-01	RA30-01	RA31-01	RA32-01	RA33-01	RA34-01	RA41-01	RA42-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	10/30/1990	10/30/1990	10/29/1990	10/29/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990
VOCs											
(mg/kg)	Acetone	NA	NA	NA	NA	NA	NA	NA	R	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	R	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	R	NA	NA
SVOCs											
(mg/kg)	bis(2-Ethyihexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	0.085 J	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	0.210 JB	NA	NA
PCBs											
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	1.900	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	1.500 J	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	2.000 U	NA	NA
Metals, total											
(mg/kg)	Aluminum	5,360	42,900	7,940	3,710	4,060	11,000	13,100	28,700	1,820	17,900
	Antimony	12.5 U	12.6 U	12.3 U	12.3 U	5.9 D	13.8	4.3 U	14.0 U	12.1 U	12.1 U
	Arsenic	1.3	2.7	1.2 D	4.2	1.6 D	1.6 D	1.1 D	3.1	1.0 D	2.0 D
	Barium	26.5 D	166	77.2	26.1 D	23.3 D	149	650	400	15.9 D	121
	Beryllium	2.3	22.5	6.3	2.1	0.68 D	1.9	7.1	11.9	5.5	13.0
	Boron	20.9 U	102	37.9 U	20.5 U	20.5 U	146	NA	59.5	20.2 U	20.2 U
	Cadmium	1.0 U	0.91	2.8	1.0 U	1.0 U	1.0 U	0.78 U	1.2 U	1.0 U	1.0 U
	Calcium	574 D	49,500	4,960	639 D	231 D	8,410	7,050	71,900	612 D	13,300
	Chromium	57.6	368	130	421	67.2	469	113	148	147	295
	Chromium (VI)	0.10 U	0.46	0.82	1.6	0.11 U	2.7	0.19	0.12 U	0.14	0.34
	Cobalt	3.4 D	19.0	8.0 D	3.9 D	2.2 D	3.5 D	12.2	6.1 D	10.1 U	8.0 D
	Copper	12.2	47.5	21.9	6.4	2.8 D	10.8	8.5	16.3	5.1	73.7
	Iron	6,620	27,100	16,500	8,400	6,060	9,070	2,460	5,100	1,760	25,400
	Lead	19.3 D	43.2	80.0	25.6	11.4	46.0	34.4	142	11.2	41.4
	Magnesium	454 D	26,000	4,620	477 D	348 D	50,500	8,290	33,800	239 D	6,650
	Manganese	591	2,830	1,540	701	332	241	269	543	137	1,060
	Mercury	0.096 U	0.074 U	0.087 U	0.096 U	0.089 U	0.11 U	0.06 U	0.11 U	0.095 U	0.097 U
	Nickel	42.1	1,110	239	78.0	10.0	356	534	299	32.7	326
	Niobium	40.8 U	32.9 U	36.5 U	41.7 U	41.1 U	40.7 U	NA	46.7 U	41.5 U	69.7
	Potassium	577 D	342 D	169 D	1,020 U	1,030 U	1,110	305 D	741 D	1,010 U	1,010 U
	Selenium	1.0 U	1.1 U	0.81 U	0.95 U	1.1 U	1.0 U	0.42 U	11.7 U	0.98 U	1.0 U
	Silver	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.0 U	0.78 U	2.3 U	2.0 U	2.0 U

Tabic A-6
Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Sample ID:	RA27-01	RA28-01	RA29-01	RA30-01	RA31-01	RA32-01	RA33-01	RA34-01	RA41-01	RA42-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	10/30/1990	10/30/1990	10/29/1990	10/29/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990
	Sodium	59.6 D	217 D	171 D	69.1 D	159 D	629 D	618 D	1,520	354 D	253 D
	Strontium	20.9 U	117	20.5 U	20.5 U	20.5 U	22.8 U	NA	171	20.2 U	26.5 U
	Titanium	142	941	416	151	119	154	NA	256	89.7	246
	Vanadium	453	4,750	1,270	390	102	436	1,510	2,450	715	1,770
	Zinc	30.5	110	148	29.0	110	41.6	28.9	209	13.0	72.0
	Zirconium	NA	NA	NA	NA	NA	NA	NA	101	NA	NA
Cyanide (mg/kg)	Cyanide, Total	1.1 U	1.1 U	1.0 U	1.1 U	1.1 U	1.1 U	NA	NA	1.0 U	0.52

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.
Values in Bold indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.

Table A-6
Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Sample ID:	RA49-01	RA50-01	RA51-01	RA52-01	RA56-01	RA57-01	SB20-01	SB-20-1	SB21-01	SB22-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-2	0-2	0-2	0-2
	Date:	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	11/6/1990	8/9/1995	11/9/1990	11/6/1990
VOCs											
(mg/kg)	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs											
(mg/kg)	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs											
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	ND	0.036 U	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	ND	0.036 U	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	0.022 J	0.036 U	NA	NA
Metals, total											
(mg/kg)	Aluminum	67,200	91,300	1,580	952	6,120	4,530	7,950	NA	10,400	6,030
	Antimony	12.5 U	12.9 U	12.8 U	12.3 U	12.5 U	12.1 U	12.8 U	NA	12.6 U	12.2 U
	Arsenic	2.9	3.1 D	1.5 D	0.79 D	1.3 D	2.0 U	4.7	NA	1.2 D	1.1 D
	Barium	212.5	683	10.9 D	9.3 D	51.2	40.5 U	152	NA	71.8	44.4
	Beryllium	35.5	18.8	0.28 D	1.0 U	1.8	1.0 U	5.7	NA	7.7	0.59 D
	Boron	171.5	208	21.4 U	20.5 U	20.8 U	20.2 U	21.3 U	NA	NA	20.3 U
	Cadmium	1 U	1.1 U	1.1 U	1.0 U	1.0 U	1.0 U	1.7	NA	1.0 U	1.0 U
	Calcium	78,800	103,000	73.0 D	58.3 D	1,960	1,010 U	13,100	NA	7,690	269 D
	Chromium	157.5	176	12.5	2.4	39.2	11.3	143	NA	162	32.7
	Chromium (VI)	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.85	NA	R	0.66
	Cobalt	7.3 D	4.3 D	10.7 U	10.3 U	4.0 D	10.1 U	9.7 D	NA	10.0 D	2.6 D
	Copper	32.1	14.3	2.6 D	1.7 D	7.4	7.5	342	NA	49.4	3.6 D
	Iron	6,610	4,280	3,480	1,610	7,410	7,500	18,900	NA	15,000	7,610
	Lead	70.1	96.7	8.2 D	4.6	58.4	21.5	3.62	NA	68.3	4.1
	Magnesium	31,200	45,800	181 D	107 D	989 D	1,010 U	4,070	NA	6,330	640 D
	Manganese	409	337	10.0	6.3	222	148	1,510	NA	3,150	85.7
	Mercury	0.08 U	0.10 U	0.10 U	0.097 U	0.099 U	0.11 U	0.085 U	NA	0.081 U	0.093 U
	Nickel	595	144	3.3 D	2.2 D	28.1	8.1 U	322	NA	463	11.4
	Niobium	46.35 J	52.0	39.8 U	40.9 U	41.6 U	40.5 U	42.6 U	NA	NA	40.6 U
	Potassium	1,040 U	1,080 U	1,070 U	1,030 U	208 D	1,010 U	556 D	NA	389 D	375 D
	Selenium	10.8 U	11.0 U	0.42 D	1.1 U	1.1 U	1.0 U	1.1 U	NA	1.0 U	1.1 U
	Silver	2.1 U	2.2 U	2.1 U	2.1 U	2.1 U	2.0 U	2.1 U	NA	2.1 U	2.0 U

Table A-6
Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Sample ID:	RA49-01	RA50-01	RA51-01	RA52-01	RA56-01	RA57-01	SB20-01	SB-20-1	SB21-01	SB22-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-2	0-2	0-2	0-2
	Date:	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	11/6/1990	8/9/1995	11/9/1990	11/6/1990
	Sodium	457 **D**	546 **D**	116 **D**	122 **D**	152 **D**	1,010 U	206 **D**	NA	195 **D**	332 **D**
	Strontium	118	228 U	21.4 U	20.5 U	20.8 U	20.2 U	110	NA	NA	20.3 U
	Titanium	150	190	78.3	52.2	150	142	341	NA	NA	133
	Vanadium	4,875	2,660	36.0	15.0	208	49.4	1,160	NA	1,810	82.9
	Zinc	50.4	89.0	6.9	6.0	335	112	59.8	NA	286	23.7
	Zirconium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	Cyanide, Total	0.5825	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	NA	1.1 U	1.1 U

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

ND - Not detected.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-6
Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Sample ID:	SB-22-1	SB23-01	SB-23-1	SB26-01	SB28-01	SB32-01	SB33-01	SS-13	SS-14
	Depth (ft.):	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-1	0-1
	Date:	8/9/1995	11/12/1990	8/8/1995	11/12/1990	11/12/1990	11/8/1990	11/8/1990	8/7/1995	8/7/1995
VOCs										
(mg/kg)	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs										
(mg/kg)	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs										
(mg/kg)	Aroclor-1248	0.036 U	NA	NA	NA	NA	ND	ND	0.035 U	0.036 U
	Aroclor-1254	0.036 U	NA	NA	NA	NA	0.13	0.016 J	0.035 U	0.064
	Aroclor-1260	0.036 U	NA	NA	NA	NA	ND	ND	0.035 U	NR
Metals, total										
(mg/kg)	Aluminum	NA	4,525	NA	6,040	104,000	3,890	4,910	NA	NA
	Antimony	NA	5.45 J	NA	4.0 U	3.9 U	12.4 U	12.2 U	NA	NA
	Arsenic	NA	0.61 D	NA	1.1 D	2.6 D	1.1 D	1.1 D	NA	NA
	Barium	NA	20.0 D	NA	28.4 D	228	30.8 D	26.3 D	NA	NA
	Beryllium	NA	R	0.41	R	R	7.8	1.1	NA	NA
	Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Cadmium	NA	0.66 U	NA	0.62 U	0.61 U	1.0 U	1.0 U	NA	NA
	Calcium	NA	206.5 D	NA	1,930	115,000	1,010 D	891 D	NA	NA
	Chrbmium	NA	R	40.7 N	R	R	1,100	180	NA	NA
	Chromiuni (VI)	NA	0.11 U	NA	0.10 U	0.10 U	0.79	0.10 U	NA	NA
	Cobalt	NA	1.185 J	NA	0.91 U	3.3 D	3.3 D	3.3 D	NA	NA
	Copper	NA	3.2 D	NA	1.5 D	33.6	13.1	5.1 D	NA	NA
	Iron	NA	8,045	NA	5,410	1,670	8,210	8,480	NA	NA
	Lead	NA	10.7 D	NA	6.0	70.4	331	15.4	NA	NA
	Magnesium	NA	609.5 D	NA	754 D	43,000	707 D	683 D	NA	NA
	Manganese	NA	46.8	NA	25.3	113	565	236	NA	NA
	Mercury	NA	0.09	NA	0.11 U	0.08 U	0.10 U	0.087 U	NA	NA
	Nickel	NA	9.4	NA	2.0 D	469	108	36.4	NA	NA
	Niobium	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Potassium	NA	409.5 D	NA	206 D	155 U	285 D	191 D	NA	NA
	Selenium	NA	R	NA	R	R	1.0 U	0.99 U	NA	NA
	Silver	NA	R	NA	R	R	2.1 U	2.3	NA	NA

Table A-6
Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Sample ID:	SB-22-1	SB23-01	SB-23-1	SB26-01	SB28-01	SB32-01	SB33-01	SS-13	SS-14
	Depth (ft.):	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-1	0-1
	Date:	8/9/1995	11/12/1990	8/8/1995	11/12/1990	11/12/1990	11/8/1990	11/8/1990	8/7/1995	8/7/1995
	Sodium	NA	290 **D**	NA	505 **D**	1,020	268 **D**	187 **D**	NA	NA
	Strontium	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium	NA	60.5	NA	14.1	3,630	1,190	145	NA	NA
	Zinc	NA	7.0	NA	9.7	49.1	243	14.2	NA	NA
	Zirconium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	Cyanide, Total	NA	1.1 U	NA	1.1 U	1.0 U	1.1 U	1.0 U	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

ND - Not detected.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

Table A-7
Analytical Results for Surface Soil Samples -- Southern Area
SMC Facility
Newfield, New Jersey

	Sample ID:	RA01-01	RA02-01	RA07-01	RA08-01	RA09-01	RA10-01	RA18-01	RA19-01	RA20-01	RA21-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990
Metals, total											
(mg/kg)	Aluminum	3,080	3,120	4,130	3,140	3,230	2,410	4,950	2,430	1,970	3,430
	Antimony	12.9 U	12.0 U	12.5 U	11.4 U	12.4 U	10.0 U	9.7 U	11.9 U	12.3 U	12.5 U
	Arsenic	1.8 **D**	1.6 **D**	1.7 **D**	1.8	1.6 **D**	1.7 **D**	3.1 **D**	1.9 **D**	1.2 **D**	1.5 **D**
	Barium	16.6 **D**	12.4 **D**	14.6 **D**	15.1 **D**	11.9 **D**	9.6 **D**	11.5 **D**	10.2 **D**	11.2 **D**	11.7 **D**
	Beryllium	1.1 U	1.0 U	1.0 U	0.27 **D**	0.72 **D**	0.17 **D**	0.39 **D**	0.99 U	1.0 U	0.95
	Boron	21.4 U	20.0 U	20.8 UJ	19.0 U	20.6 U	16.7 U	16.2 U	19.8 U	20.6 U	20.8 U
	Calcium	121 **D**	66.2 **D**	166 **D**	826 **D**	394 **D**	164 **D**	106 **D**	594 **D**	996 **D**	616 **D**
	Chromium	2.1 **D**	2.6	54.7	11.6	5.7	38.0	3.1	6.6	3.8	8.9
	Chromium (VI)	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.33	0.11 U	0.11 U	0.10 U
	Cobalt	10.7 U	10.0 U	10.4 U	9.5 U	1.8 **D**	8.3 U	2.1 **D**	9.9 U	10.3 U	1.3 **D**
	Copper	17.2	6.1	2.8 **D**	4.0 **D**	5.1 **D**	2.0 **D**	1.5 **D**	3.9 **D**	6.2	4.1 **D**
	Iron	5,340	4,080	3,630	4,050	6,160	2,530	13,900	2,860	2,150	4,400
	Lead	15.1	11.3	8.7	20.3	10.4	11.3	8.0	26.5 **D**	9.8	8.7
	Magnesium	135 **D**	115 **D**	188 **D**	392 **D**	251 **D**	155 **D**	139 **D**	111 **D**	150 **D**	1,890
	Manganese	68.4	41.3	54.8	214	49.3	62.0	19.0	42.9	47.4	39.3
	Mercury	0.10 U	0.52	0.29	0.45	0.11	0.26	0.060 U	0.09	0.41	0.091 U
	Nickel	8.6 U	8.0 U	2.4 **D**	5.9 **D**	6.7 **D**	3.7 **D**	6.0 **D**	7.9 U	8.2 U	8.3
	Potassium	1,070 U	1,000 U	294 **D**	218 **D**	262 **D**	208 **D**	245 **D**	991 U	1,030 U	316 **D**
	Selenium	1.1 U	0.94 U	1.0 U	0.79 U	0.90 U	0.97 U	1.00 U	0.88 U	1.0 U	0.94 U
	Silver	2.1 U	2.0 U	2.1 U	1.9 U	2.1 U	1.7 U	1.60 U	2.0 U	2.1 U	2.1 U
	Sodium	29.8 **D**	43.4 **D**	42.9 **D**	73.8 **D**	82.1 **D**	29.3 **D**	24.6 **D**	37.4 **D**	36.6 **D**	150 **D**
	Strontium	21.4 U	20.0 U	20.8 U	19.0 U	20.6 U	16.7 U	16.2 U	19.8 U	20.6 U	20.8 U
	Titanium	142	73.9	88.6	99.6	112	70.3	61.8	65.3	51.9	96.6
	Vanadium	6.2 **D**	5.4 **D**	20.0	34.5	124	21.6	20.8	14.4	11.5	175
	Zinc	13.7	24.9	13.5	28.1	17.1	9.9	6.1	24.3	26.9	25.9

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

NA - Sample not analyzed for the listed analyte.

ND - Not detected.

R - Rejected during data review.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Table A-7
Analytical Results for Surface Soil Samples -- Southern Area
SMC Facility
Newfield, New Jersey

	Sample ID:	RA23-01	RA24-01	RA26-01	RA35-01	RA38-01	RA39-01	RA45-01	RA47-01	RA53-01	RA54-01
	Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Date:	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990
Metals, total											
(mg/kg)	Aluminum	7,950	2,260	4,170	3,700	2,350	4,020	1,420	2,220	1,500	1,060
	Antimony	12.8 U	12.9 U	12.6 U	12.3 U	11.8 U	7.3 **D**	12.3 U	7.3 **D**	6.5 **D**	5.9 **D**
	Arsenic	4.4	1.1 **D**	5.0	6.1	0.68 **D**	1.6 **D**	1.5 **D**	1.8 **D**	1.3 **D**	1.1 **D**
	Barium	24.4 **D**	9.6 **D**	25.5 **D**	53.7	9.1 **D**	20.6 **D**	11.3 **D**	7.7 **D**	11.7 **D**	5.6 **D**
	Beryllium	8.9	1.1 U	1.8	1.8	0.37 **D**	0.385 **D**	0.31 **D**	0.32 **D**	0.27 **D**	0.33 **D**
	Boron	21.3 U	21.6 U	21.0 U	20.5 U	19.6 U	20.3 U	20.6 U	21.6 U	22.4 U	21.9 U
	Calcium	8,650	402 **D**	563 **D**	840 **D**	198 **D**	250 **D**	43.9 **D**	31.8 **D**	38.4 **D**	39.1 **D**
	Chromium	102	7.6	16.3	24.0	3.6	5.7	7.3	6.1	9.1	4.6
	Chromium (VI)	0.96	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
	Cobalt	2.9 **D**	10.8 U	3.6 **D**	2.9 **D**	9.8 U	10.1 U	10.3 U	10.8 U	11.2 U	10.9 U
	Copper	9.1	3.0 **D**	5.3	4.5 **D**	1.3 **D**	2.2 **D**	2.0 **D**	1.8 **D**	3.8 **D**	2.3 **D**
	Iron	3,890	2,620	12,300	8,530	2,260	4,780	3,030	3,690	2,830	2,380
	Lead	98.9	10.3	15.0 **D**	91.7	4.4	5.3	10.4	52.0	41.6	9.7 **D**
	Magnesium	14,900	171 B	484 **D**	1,150	212 B	389.5 **D**	162 **D**	131 **D**	136 **D**	111 **D**
	Manganese	100	77.9	164	242	36.8	53.05	7.3	5.6	5.8	5.3
	Mercury	0.099 U	0.12	0.067 U	0.11 U	0.099 U	0.080 U	0.095 U	0.11 U	0.10 U	0.11 U
	Nickel	189	3.5 **D**	29.9	39.9	3.9 **D**	5.2 **D**	8.2 U	8.6 U	2.3 **D**	8.8 U
	Potassium	388 **D**	1,080 U	223 **D**	1,020 U	982 U	1,010 U	1,030 U	1,080 U	1,120 U	1,100 U
	Selenium	1.1 U	1.1 U	1.1 U	1.1 U	1.0 U	0.5 **D**	1.0 U	2.2 U	0.51 **D**	1.1 U
	Silver	2.1 U	2.2 U	2.2	2.0 U	2.0 U	1.5 **D**	2.1 U	2.2 U	1.4 **D**	1.4 **D**
	Sodium	264 **D**	23.6 **D**	189 **D**	219 **D**	166 **D**	159 **D**	173 **D**	180 **D**	188 **D**	180 **D**
	Strontium	29.4 U	21.6 U	21.0 **D**	20.5 U	19.6 U	20.3 U	20.6 U	21.6 U	22.4 U	21.9 U
	Titanium	101	61.5	121	158	60.6	126	66.9	70.3	70.9	61.9
	Vanadium	1,810	21.1	280	302	43.6	37.95	34.3	29.6	31.6	36.5
	Zinc	96.0	21.4	79.4	476	13.3	8.9	8.9	7.6	10.7	6.2

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

NA - Sample not analyzed for the listed analyte.

ND - Not detected.

R - Rejected during data review.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Table A-7
Analytical Results for Surface Soil Samples -- Southern Area
SMC Facility
Newfield, New Jersey

	Sample ID:	SB07-01	SB08-01	SB09-01	SB-9-1	SB10-01	SB11-01	SB13-01	SB15-01	SB17-01	SB18-01
	Depth (ft.):	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2
	Date:	11/6/1990	11/8/1990	11/9/1990	8/9/1995	11/8/1990	11/14/1990	11/6/1990	11/8/1990	11/8/1990	11/8/1990
Metals, total											
(mg/kg)	Aluminum	2,090	5,360	4,550	NA	4,360	6,400	9,000	5,190	1,720	7,095
	Antimony	12.4 U	12.0 U	12.4 U	NA	13.1 U	12.6 U	12.5 U	13.1 U	12.6 U	12.8 U
	Arsenic	2.0 U	1.4 **D**	0.70 **D**	NA	0.78 **D**	0.71 **D**	1.5 **D**	1.7 **D**	1.6 **D**	1.4 **D**
	Barium	9.1 **D**	13.0 **D**	19.4 **D**	NA	14.7 **D**	27.9 **D**	110	39.6 **D**	8.1 **D**	75.15 **D**
	Beryllium	0.66 **D**	2.1	1.6	2.1	1.1 U	1.1 U	2.0	1.0 **D**	1.0	1.94 **D**
	Boron	20.7 U	19.9 U	20.7	NA	NA	NA	20.8 U	NA	NA	NA
	Calcium	65.7 **D**	4,950	95.5	NA	84.8 **D**	129 **D**	2,560	706 **D**	297 **D**	2215.8 **D**
	Chromium	3.3	30.8	22.8	NA	3.9	5.2	32.4	29.7	11.5	18.25
	Chromium (VI)	0.15	0.11 U	R	2.3	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.135
	Cobalt	10.4 U	10.0 U	1.7 **D**	NA	1.5 **D**	10.5 U	4.7 **D**	2.5 **D**	10.5 U	2.15 **D**
	Copper	1.7 **D**	2.3 **D**	3.1 **D**	NA	2.1 **D**	5.3 U	12.2	7.5	4.8 **D**	7.65 **D**
	Iron	2,460	2,200	4,440	NA	4,330	6,000	8,170	7,030	2,200	8,100
	Lead	3.5	9.3	3.4	NA	4.5	3.8	2.04	14.8	25.9	30.2
	Magnesium	305 **D**	2,440	554 **D**	NA	178 **D**	421 **D**	1,090	654 **D**	1,200	2371.5 **D**
	Manganese	11.0	92.9	36.8	NA	22.7	20.2	547	56.5	62.3	183.1
	Mercury	0.10 U	0.11 U	0.090 U	NA	0.081 U	0.084 U	0.11 U	0.098 U	0.08	0.10 U
	Nickel	8.3 U	11.6	11.0	NA	8.7 U	2.8 **D**	94.4	13.6	13.4	34 **D**
	Potassium	235 **D**	996 U	655 **D**	NA	291 **D**	1,050 U	230 **D**	325 **D**	220 **D**	781
	Selenium	1.0 U	1.0 U	1.0 U	NA	1.1 U	0.55 **D**	1.1 U	0.51 **D**	1.0 U	1.1 U
	Silver	2.1 U	2.0 U	2.1 U	NA	2.0 **D**	2.1 U	2.1 U	2.2 U	1.3 **D**	2.05
	Sodium	44.5	103 **D**	188 **D**	NA	185 **D**	1,050 U	76.1 **D**	159 **D**	223 **D**	371.5 **D**
	Strontium	20.7 U	19.9 U	20.7 U	NA	NA	NA	22.5	NA	NA	NA
	Titanium	85.2	85.2	121	NA	NA	NA	200	NA	NA	NA
	Vanadium	128	435	324	NA	10.2 B	7.4 **D**	417	139	153	270.9
	Zinc	7.7	9.2	8.7	NA	8.8	5.4	75	49.6	25.5	29.7

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

NA - Sample not analyzed for the listed analyte.

ND - Not detected.

R - Rejected during data review.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Tabic A-7
Analytical Results for Surface Soil Samples -- Southern Area
SMC Facility
Newfield, New Jersey

		Sample ID:	SS-22	SS-25	SS-26	SS-27
		Depth (ft.):	0-1	0-1	0-1	0-1
		Date:	8/7/1995	8/10/1995	8/10/1995	8/10/1995
Metals, total						
(mg/kg)	Aluminum		1,390	NA	NA	NA
	Antimony		3.0 U	NA	NA	NA
	Arsenic		1.5	NA	NA	NA
	Barium		12.3	NA	NA	NA
	Beryllium		0.13	0.24	4.3	0.35
	Boron		NA	NA	NA	NA
	Calcium		785	NA	NA	NA
	Chromium		8.0	NA	NA	NA
	Chromium (VI)		0.22 U	NA	NA	NA
	Cobalt		0.34	NA	NA	NA
	Copper		3.7	NA	NA	NA
	Iron		1,850	NA	NA	NA
	Lead		15.5	NA	NA	NA
	Magnesium		87.2	NA	NA	NA
	Manganese		69.7	NA	NA	NA
	Mercury		0.21	NA	NA	NA
	Nickel		2.2	NA	NA	NA
	Potassium		130	NA	NA	NA
	Selenium		0.11 U	NA	NA	NA
	Silver		0.27 U	NA	NA	NA
	Sodium		65.6	NA	NA	NA
	Strontium		NA	NA	NA	NA
	Titanium		NA	NA	NA	NA
	Vanadium		14.1	NA	NA	NA
	Zinc		45.8	NA	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

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ND - Not detected.

R - Rejected during data review.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Table A-8
Analytical Results for Surface Soil Samples -- Hudson Dranch Wetlands
SMC Facility
Newfield, New Jersey

	Sample ID:	RA03-01	RA04-01	RA05-01	RA06-01	RA11-01	RA12-01	RA13-01	RA14-01		RA25-01
	Sample Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	2/19/1991	10/30/1990
Metals, total											
(mg/kg)	Aluminum	3,760	3,920	7,260	1,500	2,300	37,400	7,120	8,720	NA	2,710
	Antimony	15.2 U	15.8 U	13.5 U	16.7 U	17.1 U	44.6 U	23.6 U	15.4 U	NA	12.7 U
	Arsenic	3.1	2.7	4.5	1.0 D	3.1	4.0	6.2	4.2 D	NA	1.1 D
	Darium	19.9 D	24.3 D	57.8	15.2 D	44.2 D	739	56.3 D	182	NA	18.5 D
	Deryllium	1.3 U	1.3 U	1.4	1.4 U	2.1	60.1	6.8	12.8	NA	0.46 D
	Cadmium	1.3 U	1.3 U	1.1 U	1.4 U	1.4 U	5.3	2.0 U	1.6	NA	1.1 U
	Calcium	210 D	186 D	750 D	431 D	1,400 D	7,320	3,130	3,670	NA	828 D
	Chromium	5.1	12.2	29.7	36.2	45.1	5,870	123	218	NA	8.1
	Chromium (VI)	0.14 U	0.14 U	0.16 U	0.15 U	0.15 U	0.43 U	0.38	NA	0.14 U	0.11 U
	Cobalt	12.6 U	13.2 U	1.7 D	13.9 U	14.2 U	87.1	3.1	19.5	NA	10.6 U
	Copper	39.5	19.7	8.6	5.5 D	5.5 D	887	17.6	33.6	NA	2.5 D
	Iron	7,290	8,010	10,300	1,790	5,750	32,300	12,000	9,050	NA	3,570
	Lead	49.2	93.0	76.4	49.4	40.8	760	319	257	NA	26.1
	Magnesium	114 D	221 D	572 D	202 D	1,720	4,380	2,980	3,680	NA	361 D
	Manganese	24.1	37.0	26.6	102	71.0	1,680	354	1,110	NA	123
	Mercury	0.24	0.23	0.27	0.52	0.099 U	0.51	0.44	0.17	NA	0.14
	Nickel	3.9 D	7.5 D	26.9	9.0 D	17.8	3,360	90.4	1,290	NA	9.1
	Potassium	1,260 U	1,320 U	516 D	1,400 U	480 D	1,040 D	845 D	257 D	NA	1,060 U
	Selenium	1.1 U	0.44 D	1.6 U	1.3 U	1.3 U	4.0 U	2.0 U	0.51 D	NA	1.1 U
	Silver	2.5 U	2.6 U	2.2 U	2.8 U	2.8 U	7.4 U	3.9 U	2.6 U	NA	2.1 U
	Sodium	42.4 D	50.6 D	171 D	36.9 D	184 D	349 D	218 D	163 D	NA	23.8 D
	Thallium	2.1 U	2.0 U	3.1 U	2.5 U	2.7 U	8.0 U	4.0 U	2.5 U	NA	21.4 U
	Titanium	106	127	159	78.1	51.5	1,480	197	197	NA	94.4
	Vanadium	12.7	38.8	203	36.4	403	12,100	1,360	2,560	NA	61.8
	Zinc	20.4	27.8	31.1	22.5	56.5	1,310	87.0	355	NA	18.8

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

NA - Sample not analyzed for the listed analyte.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Table A-8
Analytical Results for Surface Soil Samples -- Hudson Dranch Wetlands
SMC Facility
Newfield, New Jersey

	Sample ID:	RA36-01	RA37-01	RA40-01	RA46-01	RA48-01	SS-16	SS-17	SS-18	SS-19	SS-20
	Sample Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-1	0-1	0-1	0-1	0-1
	Sample Date:	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	8/7/1995	8/7/1995	8/7/1995	8/7/1995	8/7/1995
Metals, total											
(mg/kg)	Aluminum	1,660	1,180	2,020	1,710	1,230	724	979	1,230	3,340	782
	Antimony	6.2 D	7.0 D	15.7 U	13.7 U	13.1 U	3.8 U	4.7	3.9 U	3.6 U	3.9 U
	Arsenic	0.74 D	0.95 D	1.7 D	2.1 D	0.93 D	0.25 U	1.3	3.7	1.35	0.70
	Darium	6.5 D	8.0 D	11.6 D	7.1 D	4.3 D	21.0	4.1	10.3	40.4	6.8
	Deryllium	0.30 D	0.36 D	0.34 D	0.34 D	1.1 U	0.43	0.16	0.51	3.105	0.67
	Cadmium	0.99 U	1.2 U	1.3 U	1.1 U	1.1 U	0.44 U	0.42 U	0.44 U	0.41	0.44 U
	Calcium	107 D	111 D	219 D	43.3 D	40.6 D	981	60.6	110	1,433	228
	Chromium	3.0	16.3	10.7	9.1	5.4	8.3	3.7	11.1	45.75	18.8
	Chromium (VI)	0.10 U	0.12 U	0.13 U	0.12 U	0.12 U	1.1	5.3	1.1 U	1.8 J	1.4 U
	Cobalt	9.9 U	11.8 U	13.1 U	11.4 U	10.9 U	0.41 U	0.39 U	0.61	2.325	0.41 U
	Copper	1.2 D	2.8 D	3.3 D	2.5 D	2.4 D	7.7	4.2	4.8	8.95	1.8
	Iron	2,540	1,530	2,400	3,610	1,430	773	2,010	2,450	5,815	669
	Lead	2.9 D	11.2	16.8	19.8	7.2	18.6	13.4	39.9	64.5	14.9
	Magnesium	190 D	146 D	193 D	135 D	117 D	177	67.3	91.0	897	106
	Manganese	37.5	47.9	101	7.0	4.3	89.0	4.2	37.0	166.45	22.9
	Mercury	0.077 U	0.12 U	0.12 U	0.12 U	0.11 U	0.07	0.16	0.21	0.085	0.10
	Nickel	4.1 D	4.2 D	5.6 D	9.2 U	8.7 U	7.3	0.92 U	4.9	83.85	5.3
	Potassium	989 U	1,180 U	1,310 U	1,140 U	1,090 U	140	153	341	242	81.0 U
	Selenium	1.0 U	1.2 U	1.2 U	1.1 U	0.47 D	0.16	0.40	0.62	0.255	0.31
	Silver	2.0 U	2.4 U	2.6 U	2.3 U	1.5 D	0.35 U	0.43	0.36 U	0.33 U	0.36 U
	Sodium	160 D	250 D	222 D	195 D	174 D	109	598	84.1	407	158
	Thallium	2.0 U	2.4 U	2.5 U	2.3 U	2.2 U	0.28 U	0.27 U	0.37	0.26 U	0.28 U
	Titaniuin	55.2	53.6	66.2	76.7	42.5	NA	NA	NA	NA	NA
	Vanadium	35.9	65.3	47.7	40.5	31.0	44.4	17.3	62.6	571	83.9
	Zinc	10.0	10.4	21.4	10.6	6.3	23.4	6.0	9.6	46.1	8.2

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

NA - Sample not analyzed for the listed analyte.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Table A-8
Analytical Results for Surface Soil Samples -- Hudson Branch Wetlands
SMC Facility
Newfield, New Jersey

	Sample ID:	SS-21	SS-23	SS-24	SS-28	SD-100B	SD-100C	SD-101B	SD-101C	SD-102A	SD-102B
	Sample Depth (ft.):	0-1	0-1	0-1	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	8/7/1995	8/7/1995	8/7/1995	8/10/1995	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996
Metals, total											
(mg/kg)	Aluminum	2,760	2,670	2,140	1,090	NA	NA	NA	NA	NA	NA
	Antimony	3.1 U	3.4 U	3.3 U	2.8 U	NA	NA	NA	NA	NA	NA
	Arsenic	2.3	2.3	1.6	2.1	NA	NA	NA	NA	NA	NA
	Barium	18.5	12.8	14.5	4.3	NA	NA	NA	NA	NA	NA
	Beryllium	0.13	0.28	0.19	0.10	NA	NA	NA	NA	NA	NA
	Cadmium	0.35 U	0.39 U	0.37 U	0.30 U	NA	NA	NA	NA	NA	NA
	Calcium	1,750	1,090	845	35.9	NA	NA	NA	NA	NA	NA
	Chromium	11.6	8.6	9.5	7.7	1,470	2,610	710	4,530	523	114
	Chromium (VI)	0.23 U	0.25 U	0.24 U	0.52 U	NA	NA	NA	NA	NA	NA
	Cobalt	0.43	0.39	1.00	0.40	NA	NA	NA	NA	NA	NA
	Copper	8.0	4.4	3.8	1.7	36.3 D	64.9	11.2 D	60.9	48.0	21.8 D
	Iron	3,030	5,050	2,380	2,350	NA	NA	NA	NA	NA	NA
	Lead	20.4	17.3	14.4	14.3	NA	NA	NA	NA	NA	NA
	Magnesium	222	103	83.2	46.1	NA	NA	NA	NA	NA	NA
	Manganese	123	78.3	100	6.3	NA	NA	NA	NA	NA	NA
	Mercury	0.31	0.38	0.19	0.09	NA	NA	NA	NA	NA	NA
	Nickel	4.0	2.4	3.4	1.9	60.8 D	91.3	28.8 D	162	83.0	26.4 D
	Potassium	147	76.3	147	59.4 U	NA	NA	NA	NA	NA	NA
	Selenium	0.16	0.30	0.22	0.13 U	NA	NA	NA	NA	NA	NA
	Silver	0.28 U	0.31 U	0.30 U	0.26 U	NA	NA	NA	NA	NA	NA
	Sodium	61.3	331	155	44.5	NA	NA	NA	NA	NA	NA
	Thallium	0.23 U	0.25 U	0.24 U	0.21 U	NA	NA	NA	NA	NA	NA
	Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium	19.7	22.4	22.4	12.7	679	1,030	290	1,420	588	199
	Zinc	30.7	23.6	22.3	4.8	NA	NA	NA	NA	NA	NA

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
D - Detected below the quantitation limit and above the method detection limit
NA - Sample not analyzed for the listed analyte.
U - Compound was not detected at specified quantitation limit.
Values in Bold indicate the compound was detected.

Table A-8
Analytical Results for Surface Soil Samples -- Hudson Branch Wetlands
SMC Facility
Newfield, New Jersey

	Sample ID:	SD-103A	SD-103B	SD-103C	SD-104A	SD-104B	SD-105A	SD-105D	SD-106A	SD-106C	SD-107A
	Sample Depth (ft.):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996
Metals, total											
(mg/kg)	Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chromium	**766**	**429**	**428**	**8,940**	**213**	**463**	**156**	**222**	**84.9**	**7,830**
	Chromium (VI)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Copper	**21.1 D**	**17.8 D**	**16.8 D**	**126**	**37.5**	**38.0**	**17.0 B**	**49.2**	**15.1**	**85.1**
	Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Nickel	**29.9 D**	**43.0 D**	**9.3 U**	**44.1**	**38.4**	**61.5**	**38.6 D**	**28.9**	**43.8**	**1,100**
	Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium	**529**	**386**	**403**	**171**	**349**	**665**	**777**	**473**	**645**	**2,370**
	Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

D - Detected below the quantitation limit and above the method detection limit

NA - Sample not analyzed for the listed analyte.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Table A-8
Analytical Results for Surface Soil Samples -- Hudson Branch Wetlands
SMC Facility
Newfield, New Jersey

		Sample ID:	SD-107B
		Sample Depth (ft.):	0-0.5
		Sample Date:	4/11/1996
Metals, total			
(mg/kg)	Aluminum		NA
	Antimony		NA
	Arsenic		NA
	Barium		NA
	Beryllium		NA
	Cadmium		NA
	Calcium		NA
	Chromium		**700**
	Chromium (VI)		NA
	Cobalt		NA
	Copper		**45.1**
	Iron		NA
	Lead		NA
	Magnesium		NA
	Manganese		NA
	Mercury		NA
	Nickel		**121**
	Potassium		NA
	Selenium		NA
	Silver		NA
	Sodium		NA
	Thallium		NA
	Titanium		NA
	Vanadium		**1,320**
	Zinc		NA

APPENDIX B
SUMMARY STATISTICS

Table B-1
Summary of Analytical Results for Surface Water Samples – Hudson Branch
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (ug/L)	Max. of Detects (ug/L)	Location of Maximum Detect	Min. of Non-Detects (ug/L)	Max. of Non-Detects (ug/L)	Mean Concentration (ug/L)	Mean UCL (ug/L)	UCL Rationale
Metals, total												
	Aluminum	5	5	100.0%	169	2310	SW-25	--	--	949	2310	Max. of Detects
	Arsenic	5	2	40.0%	2.8	3.2	SW-8	1.8	1.8	2.28	3.2	Max. of Detects
	Barium	5	5	100.0%	34	119	SW-27	--	--	63.5	119	Max. of Detects
	Beryllium	5	3	60.0%	1	2.6	SW-25	0.7	0.7	1.20	2.6	Max. of Detects
	Calcium	5	5	100.0%	3650	5220	SW-27	--	--	4587	5220	Max. of Detects
	Chromium	5	5	100.0%	19.6	101	SW-8	--	--	48.3	101	Max. of Detects
	Cobalt	5	3	60.0%	3.9	10.1	SW-25	2.9	2.9	5.44	10.1	Max. of Detects
	Copper	5	5	100.0%	6	23.2	SW-8	--	--	11.8	23.2	Max. of Detects
	Iron	5	5	100.0%	150	3080	SW-25	--	--	1037	3080	Max. of Detects
	Lead	5	3	60.0%	2.7	3.4	SW-27	0.7	0.7	2.08	3.4	Max. of Detects
	Magnesium	5	5	100.0%	2620	8670	SW-25	--	--	4811	8670	Max. of Detects
	Manganese	5	5	100.0%	9.4	194	SW-27	--	--	73.8	194	Max. of Detects
	Nickel	5	4	80.0%	8.1	19.2	SW-25	6.8	6.8	10.8	19.2	Max. of Detects
	Potassium	5	5	100.0%	4890	21850	SW-11	--	--	14020	21850	Max. of Detects
	Selenium	5	2	40.0%	1.7	4.4	SW-8	1.2	1.5	2.00	4.4	Max. of Detects
	Sodium	5	5	100.0%	15000	205500	SW-11	--	--	118420	205500	Max. of Detects
	Vanadium	5	5	100.0%	33.45	413	SW-25	--	--	183	413	Max. of Detects
	Zinc	5	5	100.0%	24.6	287	SW-8	--	--	93.7	287	Max. of Detects
General Chemistry												
	Hardness	4	4	100.0%	21600	29400	SW-27	--	--	24250	29400	Max. of Detects

Notes:
ug/L - micrograms per liter.
UCL - Upper confidence limit.

Table B-2
Summary of Analytical Results for Surfaee Water Samples – Reference Area
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (ug/L)	Max. of Detects (ug/L)	Location of Maximum Detect	Min. of Non-Detects (ug/L)	Max. of Non-Detects (ug/L)	Mean Concentration (ug/L)	Mean UCL (ug/L)	UCL Rationale
Metals, total												
	Aluminum	2	2	100.0%	127	163	SW-30	--	--	145	163	Max. of Detects
	Barium	2	2	100.0%	162	174	SW-30	--	--	168	174	Max. of Detects
	Calcium	2	2	100.0%	8330	8960	SW-30	--	--	8645	8960	Max. of Detects
	Cobalt	2	2	100.0%	6.3	7.9	SW-31	--	--	7.10	7.9	Max. of Detects
	Copper	2	2	100.0%	2.7	3.3	SW-31	--	--	3.00	3.3	Max. of Detects
	Iron	2	2	100.0%	259	301	SW-30	--	--	280	301	Max. of Detects
	Lead	2	2	100.0%	0.9	0.9	SW-30	--	--	0.90	0.9	Max. of Detects
	Magnesium	2	2	100.0%	4160	4440	SW-30	--	--	4300	4440	Max. of Detects
	Manganese	2	2	100.0%	180	271	SW-31	--	--	226	271	Max. of Detects
	Nickel	2	1	50.0%	10.5	10.5	SW-31	6.9	6.9	8.70	10.5	Max. of Detects
	Potassium	2	2	100.0%	2600	3080	SW-30	--	--	2840	3080	Max. of Detects
	Sodium	2	2	100.0%	5970	6390	SW-30	--	--	6180	6390	Max. of Detects
	Zinc	2	2	100.0%	77.6	85.9	SW-31	--	--	81.8	85.9	Max. of Detects
General Chemistry												
	Hardness	2	2	100.0%	37400	38300	SW-30	--	--	37850	38300	Max. of Detects

Notes:
ug/L - micrograms per liter.
UCL - Upper confidence limit.

Table B-3
Summary of Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale
VOCs												
	1,2-Dichloroethene (Total)	5	2	40.0%	0.002	0.005	SD4-01	0.012	0.07	0.021	0.005	Max. of Detects
	2-Butanone	5	5	100.0%	0.055	0.13	SD2-01	--	--	0.082	0.130	Max. of Detects
	Acetone	5	5	100.0%	0.22	0.43	SD2-01	--	--	0.309	0.430	Max. of Detects
	Carbon Disulfide	5	1	20.0%	0.004	0.004	SD5-01	0.008	0.07	0.021	0.004	Max. of Detects
	Methylene Chloride	5	5	100.0%	0.0925	0.87	SD2-01	--	--	0.258	0.870	Max. of Detects
	Trichloroethene	5	1	20.0%	0.007	0.007	SD5-01	0.008	0.07	0.022	0.007	Max. of Detects
SVOCs												
	Benzo(b)fluoranthene	2	1	50.0%	0.11	0.11	SD4-01	0.98	0.98	0.545	0.110	Max. of Detects
	Benzoic acid	2	2	100.0%	1	3.2	SD4-01	--	--	2.10	3.20	Max. of Detects
	bis(2-ethylhexyl)phthalate	2	2	100.0%	0.27	0.58	SD1-01	--	--	0.425	0.580	Max. of Detects
	Butyl benzyl phthalate	2	1	50.0%	0.14	0.14	SD1-01	0.9	0.9	0.520	0.140	Max. of Detects
	Chrysene	2	1	50.0%	0.14	0.14	SD4-01	0.98	0.98	0.560	0.140	Max. of Detects
	Di-n-butyl phthalate	2	2	100.0%	0.49	0.58	SD4-01	--	--	0.535	0.580	Max. of Detects
	Fluoranthene	2	2	100.0%	0.12	0.21	SD4-01	--	--	0.165	0.210	Max. of Detects
	Pentachlorophenol	2	1	50.0%	0.33	0.33	SD1-01	4.5	4.5	2.41	0.330	Max. of Detects
	Phenanthrene	2	1	50.0%	0.11	0.11	SD4-01	0.98	0.98	0.545	0.110	Max. of Detects
	Phenol	2	2	100.0%	0.1	0.52	SD4-01	--	--	0.310	0.520	Max. of Detects
	Pyrene	2	1	50.0%	0.13	0.13	SD4-01	0.98	0.98	0.555	0.130	Max. of Detects
PCBs												
	Aroclor-1248	6	1	16.7%	1.3	1.3	SD15-01	0.059	0.23	0.355	1.300	Max. of Detects
	Aroclor-1254	5	3	60.0%	0.095	0.25	SD11-01	0.059	0.14	0.141	0.250	Max. of Detects
	Aroclor-1260	5	1	20.0%	0.59	0.59	SD15-01	0.059	0.42	0.320	0.590	Max. of Detects
Pesticides												
	4,4'-DDD	6	3	50.0%	0.0053	0.074	SD21-01	0.0059	0.046	0.029	0.074	Max. of Detects
	4,4'-DDE	6	3	50.0%	0.011	0.046	SD21-01	0.0059	0.046	0.025	0.046	Max. of Detects
	4,4'-DDT	6	3	50.0%	0.028	0.051	SD21-01	0.0059	0.046	0.031	0.051	Max. of Detects
Metals, total												
	Aluminum	35	35	100.0%	276	32700	SD-19	--	--	13538	16217	95% Student's-t UCL
	Antimony	35	28	80.0%	6.6	270	SD2-01	3.1	10.4	57.0	75.14	95% KM (BCA) UCL
	Arsenic	45	45	100.0%	0.36	77.6	SD-19	--	--	13.2	17.39	95% Approximate Gamma UCL
	Barium	35	35	100.0%	14.2	688	SD-19	--	--	262.4	309	95% Student's-t UCL
	Beryllium	35	35	100.0%	0.18	22.8	SD2-01	--	--	7.13	9.81	95% Approximate Gamma UCL
	Cadmium	45	12	26.7%	0.59	3.9	SD11-02	0.33	9.5	1.61	1.29	95% KM (t) UCL
	Calcium	35	35	100.0%	169	5110	SD-19	--	--	2497	2857	95% Student's-t UCL
	Chromium	50	50	100.0%	72.4	15700	SD2-01	--	--	3545	4634	95% Approximate Gamma UCL
	Cobalt	35	35	100.0%	0.8	67.3	SD-19	--	--	19.9	26.02	95% Approximate Gamma UCL
	Copper	50	50	100.0%	1.8	611	SD11-02	--	--	130.7	172.8	95% Approximate Gamma UCL
	Iron	45	45	100.0%	448	43500	SD-19	--	--	15797	20090	95% Approximate Gamma UCL
	Lead	45	45	100.0%	4.2	436.5	SD10-01	--	--	135.4	175.4	95% Approximate Gamma UCL
	Magnesium	35	35	100.0%	43.7	2440	SD-10	--	--	1180	1375	95% Student's-t UCL

Table B-3
Summary of Analytical Results for Sediment Samples -- Hudson Branch
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale
	Manganese	45	45	100.0%	16.6	1210	SD-19	--	--	390.6	486.7	95% Approximate Gamma UCL
	Mercury	45	38	84.4%	0.13	8.3	SD18-01	0.06	0.26	0.942	1.35	95% KM (BCA) UCL
	Nickel	50	50	100.0%	1.9	1090	SD15-01	--	--	215.3	287.5	95% Approximate Gamma UCL
	Potassium	35	28	80.0%	70.1	1960	SD-9A	65.6	2170	711.0	783.2	95% KM (BCA) UCL
	Selenium	35	25	71.4%	0.29	7.2	SD11-02	0.14	5.2	1.74	2.09	95% KM (Percentile Bootstrap) UCL
	Silver	35	1	2.9%	3.9	3.9	SD-19	0.29	9.5	1.77	3.90	Max. of Detects
	Sodium	35	35	100.0%	89.1	3370	SD12-01	--	--	1300	1686	95% Approximate Gamma UCL
	Thallium	34	1	2.9%	1.1	1.1	SD-10	0.23	10.3	1.27	1.10	Max. of Detects
	Vanadium	40	40	100.0%	15.2	4870	SD-19	--	--	1438	1983	95% Approximate Gamma UCL
	Zinc	45	45	100.0%	5.9	767	SD-19	--	--	227.6	296.1	95% Approximate Gamma UCL
Total Organic Carbon												
	Total Organic Carbon	40	40	100.0%	3530	400000	SD25-01	--	--	100079	124834	95% Approximate Gamma UCL

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

UCL - Upper concentration limit.

Table B-4
Summary of Analytical Results for Sediment Samples -- Reference Area
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale
Metals, total												
	Aluminum	5	5	100.0%	1070	4320	SD30-01	--	--	3474	4320	Max. of Detects
	Arsenic	7	4	57.1%	1.2	2.7	SD-30	0.27	10	3.95	2.7	Max. of Detects
	Barium	5	5	100.0%	25.3	236	SD30-01	--	--	116	236	Max. of Detects
	Beryllium	5	4	80.0%	0.18	1.6	SD30-01	0.66	0.66	0.84	1.6	Max. of Detects
	Cadmium	7	1	14.3%	2.1	2.1	SD30-01	0.38	2.6	1.54	2.1	Max. of Detects
	Calcium	5	5	100.0%	245	3090	SD30-01	--	--	1399	3090	Max. of Detects
	Chromium	7	7	100.0%	1.6	38.3	SD-35-0309-A	--	--	10.3	38.3	Max. of Detects
	Cobalt	5	5	100.0%	3.8	31.7	SD30-01	--	--	15.7	31.7	Max. of Detects
	Copper	7	6	85.7%	1.3	28.3	SD-35-0309-A	13	13	9.57	28.3	Max. of Detects
	Iron	7	7	100.0%	590	15000	SD-35-0309-A	--	--	5139	15000	Max. of Detects
	Lead	7	7	100.0%	4	91.9	SD-35-0309-A	--	--	40.6	91.9	Max. of Detects
	Magnesium	5	5	100.0%	93.6	705	SD30-01	--	--	381	705	Max. of Detects
	Manganese	7	7	100.0%	35.4	406	SD-30-0309-A	--	--	177	406	Max. of Detects
	Mercury	7	6	85.7%	0.07	1.5	SD-35-0309-A	0.06	0.06	0.82	1.5	Max. of Detects
	Nickel	7	5	71.4%	2.4	22.3	SD-35-0309-A	6.5	21	12.0	22.3	Max. of Detects
	Potassium	5	2	40.0%	201	385	SD30-01	84.4	374	254	385	Max. of Detects
	Selenium	5	3	60.0%	0.27	1.6	SD-35	0.18	0.68	0.74	1.6	Max. of Detects
	Sodium	5	5	100.0%	56.8	192	SD30-01	--	--	127	192	Max. of Detects
	Vanadium	5	5	100.0%	1.4	10.9	SD30-01	--	--	6.86	10.9	Max. of Detects
	Zinc	7	7	100.0%	8.7	87.6	SD-35-0309-A	--	--	43.6	87.6	Max. of Detects
Total Organic Carbon												
	Total Organic Carbon	7	7	100.0%	3710	248000	SD-35-0309-A	--	--	137584	248000	Max. of Detects

Notes:
UCL - Upper concentration limit.
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

Table B-5
Summary of Analytical Results for Surface Soil Samples - Former Lagoon Area
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale
Metals, total												
(mg/kg)	Aluminum	9	9	100.0%	2440	8610	SB55-01	--	--	4597	5676	95% Shident's-t UCL
	Antimony	9	1	11.1%	6.5	6.5	SB82-01	4.5	13.1	5.73	6.50	Max. of Detects
	Arsenic	9	8	88.9%	0.42	2.1	RA17-01	2.1	2.1	1.11	1.45	95% KM (t) UCL
	Barium	9	9	100.0%	8.6	36.2	SB55-01	--	--	20.6	26.2	95% Student's-t UCL
	Beryllium	9	9	100.0%	0.3	3.5	SB55-01	--	--	1.05	2.99	95% Chebyshev (Mean, Sd) UCL
	Calcium	9	9	100.0%	84.3	1890	SB55-01	--	--	575	1308	95% Approximate Gamma UCL
	Chromium	9	9	100.0%	0.89	51.4	RA22-01	--	--	24.5	36.4	95% Student's-t UCL
	Chromium (VI)	9	3	33.3%	0.12	0.3	RA22-01	0.11	0.11	0.12	0.30	Max. of Detects
	Cobalt	9	7	77.8%	1.3	8.2	SB55-01	10.7	10.8	3.48	4.40	95% KM (BCA) UCL
	Copper	9	9	100.0%	1.4	91.3	SB55-01	--	--	13.8	56.2	95% Chebyshev (Mean, Sd) UCL
	Iron	9	9	100.0%	2780	23200	SB55-01	--	--	9183	13014	95% Student's-t UCL
	Lead	9	9	100.0%	4.3	14.7	SB83-01	--	--	9.92	12.1	95% Student's-t UCL
	Magnesium	9	9	100.0%	155	1460	SB55-01	--	--	483	861	95% Approximate Gamma UCL
	Manganese	9	9	100.0%	21.7	408	RA22-01	--	--	140	283	95% Approximate Gamma UCL
	Nickel	9	9	100.0%	3.7	179	SB55-01	--	--	35.4	179	Max. of Detects
	Potassium	9	5	55.6%	180	405	SB61-01	185	1020	343	361	95% KM (t) UCL
	Selenium	9	1	11.1%	0.42	0.42	SB64-01	0.42	1.1	0.47	0.42	Max. of Detects
	Sodium	9	7	77.8%	34.8	434	RA22-01	1010	1020	228	250	95% KM (t) UCL
	Titanium	2	2	100.0%	57.8	128	RA22-01	--	--	92.9	128	Max. of Detects
	Vanadium	9	9	100.0%	29.4	671	SB55-01	--	--	187.2	671	Max. of Detects
	Zinc	9	9	100.0%	3.8	48.9	SB55-01	--	--	19.5	27.6	95% Student's-t UCL

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper Confidence Limit.

Table B-6
Summary of Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale
SVOCs												
	bis(2-ethylhexyl)phthalate	1	1	100.0%	0.085	0.085	RA34-01	--	--	0.085	0.085	Max. of Detects
	Di-n-butyl phthalate	1	1	100.0%	0.21	0.21	RA34-01	--	--	0.21	0.21	Max. of Detects
PCBs												
	Aroclor-1248	8	1	12.5%	1.9	1.9	RA34-01	0.035	0.036	0.41	1.90	Max. of Detects
	Aroclor-1254	8	4	50.0%	0.016	1.5	RA34-01	0.035	0.036	0.26	1.50	Max. of Detects
	Aroclor-1260	7	1	14.3%	0.022	0.022	SB20-01	0.035	2	0.43	0.02	Max. of Detects
Metals, total												
	Aluminum	24	24	100.0%	952	104000	SB28-01	--	--	18997	44417	95% Chebyshev (Mean, Sd) UCL
	Antimony	24	3	12.5%	5.45	13.8	RA32-01	3.9	14	10.9	13.8	Max. of Detects
	Arsenic	24	23	95.8%	0.61	4.7	SB20-01	2	2	1.87	2.81	95% KM (Chebyshev) UCL
	Barium	24	23	95.8%	9.3	683	RA50-01	40.5	40.5	136	303	95% KM (Chebyshev) UCL
	Beryllium	25	23	92.0%	0.28	35.5	RA49-01	1	1	7.04	15.24	95% KM (Chebyshev) UCL
	Boron	17	5	29.4%	59.5	208	RA50-01	20.2	37.9	56.0	208	Max. of Detects
	Cadmium	24	3	12.5%	0.91	2.8	RA29-01	0.61	1.2	1.06	2.80	Max. of Detects
	Calcium	24	23	95.8%	58.3	115000	SB28-01	1010	1010	20091	51451	95% KM (Chebyshev) UCL
	Chromium	25	25	100.0%	2.4	1100	SB32-01	--	--	194	305	95% Approximate Gamma UCL
	Chromium (VI)	24	11	45.8%	0.14	2.7	RA32-01	0.1	0.12	0.43	0.68	95% KM (t) UCL
	Cobalt	24	19	79.2%	1.185	19	RA28-01	0.91	10.7	6.56	7.20	95% KM (Percentile Bootstrap) UCL
	Copper	24	24	100.0%	1.5	342	SB20-01	--	--	30.1	91.4	95% Chebyshev (Mean, Sd) UCL
	Iron	24	24	100.0%	1610	27100	RA28-01	--	--	8862	11657	95% Approximate Gamma UCL
	Lead	24	24	100.0%	3.62	331	SB32-01	--	--	51.0	77.4	95% Approximate Gamma UCL
	Magnesium	24	23	95.8%	107	50500	RA32-01	1010	1010	11144	45337	99% KM (Chebyshev) UCL
	Manganese	24	24	100.0%	6.3	3150	SB21-01	--	--	629	1024	95% Approximate Gamma UCL
	Mercury	24	1	4.2%	0.09	0.09	SB23-01	0.06	0.11	0.093	0.090	Max. of Detects
	Nickel	24	23	95.8%	2	1110	RA28-01	8.1	8.1	218	460	95% KM (Chebyshev) UCL
	Niobium	17	3	17.6%	46.35	69.7	RA42-01	32.9	46.7	43.3	69.7	Max. of Detects
	Potassium	24	14	58.3%	169	1110	RA32-01	155	1080	638	477	95% KM (t) UCL
	Selenium	24	2	8.3%	0.42	0.42	RA51-01	0.42	11.7	2.41	0.42	Max. of Detects
	Silver	24	1	4.2%	2.3	2.3	SB33-01	0.78	2.3	2.04	2.30	Max. of Detects
	Sodium	24	23	95.8%	59.6	1520	RA34-01	1010	1010	394	662	95% KM (Chebyshev) UCL
	Strontium	17	4	23.5%	110	171	RA34-01	20.2	228	58.8	171	Max. of Detects
	Titanium	17	17	100.0%	52.2	941	RA28-01	--	--	221	313	95% H-UCL
	Vanadium	24	24	100.0%	14.1	4875	RA49-01	--	--	1241	2102	95% Approximate Gamma UCL
	Zinc	24	24	100.0%	6	335	RA56-01	--	--	86.8	130	95% Approximate Gamma UCL
	Zirconium	1	1	100.0%	101	101	RA34-01	--	--	101	101	Max. of Detects
	Cyanide, Total	22	2	9.1%	0.52	0.58	RA49-01	1	1.1	1.03	0.58	Max. of Detects

Table B-6
Summary of Analytical Results for Surface Soil Samples -- Eastern Storage Areas
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
UCL - Upper Confidence Limit.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.

Table B-7
Summary of Analytical Results for Surface Soil Samples -- Southern Area
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale
Metals, total												
	Aluminum	30	30	100.0%	1060	9000	SB13-01	--	--	3657	4341	95% Approximate Gamma UCL
	Antimony	30	4	13.3%	5.9	7.3	RA39-01	3	13.1	6.05	7.30	Max. of Detects
	Arsenic	30	29	96.7%	0.68	6.1	RA35-01	2	2	1.82	2.83	95% KM (Chebyshev) UCL
	Barium	30	30	100.0%	5.6	110	SB13-0t	--	--	21.1	38.9	95% Chebyshev (Mean, Sd) UCL
	Beryllium	34	26	76.5%	0.13	8.9	RA23-01	0.99	1.1	1.14	2.88	97.5% KM (Chebyshev) UCL
	Boron	24	1	4.2%	20.7	20.7	SB09-01	16.2	22.4	10.6	20.7	Max. of Detects
	Calcium	30	30	100.0%	31.8	8650	RA23-01	--	--	900	2046	95% H-UCL
	Chromium	30	30	100.0%	2.1	102	RA23-01	--	--	16.3	24.7	95% H-UCL
	Chromiun (VI)	31	6	19.4%	0.135	2.3	SB-9-1	0.1	0.22	0.18	2.30	Max. of Detects
	Cobalt	30	12	40.0%	0.34	4.7	SB13-01	8.3	11.2	3.99	2.85	95% KM (t) UCL
	Copper	30	29	96.7%	1.3	17.2	RA01-01	5.3	5.3	4.53	5.67	95% KM (BCA) UCL
	Iron	30	30	100.0%	1850	13900	RA18-01	--	--	4740	5668	95% Approximate Gamma UCL
	Lead	30	30	100.0%	2.04	98.9	RA23-01	--	--	19.4	28.7	95% H-UCL
	Magnesium	30	30	100.0%	87.2	14900	RA23-01	--	--	1022	3173	95% Chebyshev (Mean, Sd) UCL
	Manganese	30	30	100.0%	5.3	547	SB13-01	--	--	81.3	115	95% Approximate Gamma UCL
	Mercury	30	10	33.3%	0.08	0.52	RA02-01	0.06	0.11	0.12	0.18	95% KM (t) UCL
	Nickel	30	21	70.0%	2.2	189	RA23-01	7.9	8.8	17.6	60.3	97.5% KM (Chebyshev) UCL
	Potassium	30	16	53.3%	130	781	SB18-01	982	1120	410	386	95% KM (t) UCL
	Selenium	30	4	13.3%	0.51	0.55	SB11-01	0.11	2.2	0.51	0.55	Max. of Detects
	Silver	30	7	23.3%	1.3	2.2	RA26-01	0.27	2.2	1.15	2.20	Max. of Detects
	Sodium	30	29	96.7%	23.6	371.5	SB18-01	1050	1050	141	198	95% KM (Chebyshev) UCL
	Strontium	24	2	8.3%	21	22.5	SB13-01	16.2	29.4	11.3	22.5	Max. of Detects
	Titanium	24	24	100.0%	51.9	200	SB13-01	--	--	93.8	107	95% Approximate Gamma UCL
	Vanadium	30	30	100.0%	5.4	1810	RA23-01	--	--	165	398	95% H-UCL
	Zinc	30	30	100.0%	5.4	476	RA35-01	--	--	39.5	108	95% Chebyshev (Mean, Sd) UCL

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
UCL - Upper Confidence Limit

Table B-8
Summary of Analytical Results for Surface Soil Samples -- Hudson Branch Wetlands
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects (mg/kg)	Max. of Non-Detects (mg/kg)	Mean Concentration (mg/kg)	Mean UCL (mg/kg)	UCL Rationale
Metals, total												
	Aluminum	23	23	100.0%	724	37400	RA12-01	--	--	4270	11124	95% Chebyshev (Mean, Sd) UCL
	Antimony	23	3	13.0%	4.7	7	RA37-01	2.8	44.6	11.4	7.00	Max. of Detects
	Arsenic	23	22	95.7%	0.7	6.2	RA13-01	0.25	0.25	2.26	2.78	95% KM (BCA) UCL
	Barium	23	23	100.0%	4.1	739	RA12-01	--	--	57.7	197	95% Chebyshev (Mean, Sd) UCL
	Beryllium	23	19	82.6%	0.1	60.1	RA12-01	1.1	1.4	4.16	30.2	99% KM (Chebyshev) UCL
	Cadmium	23	3	13.0%	0.41	5.3	RA12-01	0.3	2	1.12	5.30	Max. of Detects
	Calcium	23	23	100.0%	35.9	7320	RA12-01	--	--	1086	1837	95% Approximate Gamma UCL
	Chromium	40	40	100.0%	3	8940	SD-104A	--	--	918	3004	97.5% Chebyshev (Mean, Sd) UCL
	Chromiuin (VI)	23	4	17.4%	0.38	5.3	SS-17	0.1	1.4	0.62	5.30	Max. of Detects
	Cobalt	23	10	43.5%	0.39	87.1	RA12-01	0.39	14.2	10.4	30.0	97.5% KM (Chebyshev) UCL
	Copper	40	40	100.0%	1.2	887	RA12-01	--	--	44.7	68.2	95% H-UCL
	Iron	23	23	100.0%	669	32300	RA12-01	--	--	5482	7789	95% Approximate Gamma UCL
	Lead	23	23	100.0%	2.9	760	RA12-01	--	--	84.6	236	95% Chebyshev (Mean, Sd) UCL
	Magnesium	23	23	100.0%	46.1	4380	RA12-01	--	--	731	1859	95% Chebyshev (Mean, Sd) UCL
	Manganese	23	23	100.0%	4.2	1680	RA12-01	--	--	189	550	95% Chebyshev (Mean, Sd) UCL
	Mercury	23	17	73.9%	0.07	0.52	RA06-01	0.077	0.12	0.21	0.25	95% KM (t) UCL
	Nickel	40	36	90.0%	1.9	3360	RA12-01	0.92	9.3	174	746	97.5% KM (Chebyshev) UCL
	Potassium	23	12	52.2%	76.3	1040	RA12-01	59.4	1400	664	455	95% KM (t) UCL
	Selenium	23	11	47.8%	0.16	0.62	SS-18	0.13	4	0.91	0.41	95% KM (t) UCL
	Silver	23	2	8.7%	0.43	1.5	RA48-01	0.26	7.4	1.86	1.50	Max. of Detects
	Sodium	23	23	100.0%	23.8	598	SS-17	--	--	182	244	95% Approximate Gamma UCL
	Thallium	23	1	4.3%	0.37	0.37	SS-18	0.21	21.4	2.70	0.37	Max. of Detects
	Titanium	14	14	100.0%	42.5	1480	RA12-01	--	--	199	633	95% Chebyshev (Mean, Sd) UCL
	Vanadium	40	40	100.0%	12.7	12100	RA12-01	--	--	754	2089	95% Chebyshev (Mean, Sd) UCL
	Zinc	23	23	100.0%	4.8	1310	RA12-01	--	--	94.0	344	95% Chebyshev (Mean, Sd) UCL
pH (s.u.)	pH	1	1	100.0%	4	4	SS-28	--	--	4.00	4.00	Max. of Detects

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
s.u. - Standard units.
UCL - Upper Confidence Limit

APPENDIX C
BERA SCOPE OF WORK

Introduction

The screening-level ecological risk assessment (SLERA) concluded that surface water concentrations of aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc and sediment concentrations of chromium, copper, lead, mercury, nickel and zinc may pose a potential risk to the aquatic invertebrate community present within the Hudson Branch. In addition, avian/mammalian herbivores (represented by the mallard and muskrat) are potentially at risk from sediment concentrations of chromium that may bioaccumulate within aquatic vegetation. Mammalian insectivores (represented by the little brown bat) may be at risk from the modeled concentrations of antimony, chromium and vanadium within the tissues of aquatic invertebrates that may be consumed by foraging bats. Avian insectivores (represented by the tree swallow) are potentially at risk from sediment concentrations of barium, chromium, copper, mercury and vanadium that may bioaccumulate in aquatic invertebrates. In summary, contaminants of potential ecological concem (COPECs) retained for the aquatic habitat provided by the Hudson Branch that require further evaluation include aluminum, antimony, barium, chromium, copper, iron, lead, manganese, mercury, nickel, vanadium and zinc.

The SLERA also concluded that surface soil concentrations of manganese, nickel and vanadium at the eastem storage areas and the concentrations of vanadium in surface soils of the southem area and Hudson Branch wetland may present a potential risk to the plant communities inhabiting these areas. Manganese, nickel and vanadium were retained as COPECs requiring further evaluation regarding potential impacts to the plant communities within these respective areas.

The potential risks to terrestrial wildlife indicator species foraging at the former lagoons area, eastem storage areas, southem area and the Hudson Branch wetland were evaluated in the SLERA. The surface soil concentrations of chromium and vanadium may present a risk to avian and mammalian insectivores (represented by the American robin and short-tailed shrew) that forage at the eastem storage areas. Therefore, chromium and vanadium were retained as COPECs for the eastem storage area and will be evaluated further. Surface soil concentrations of chromium may pose a risk to foraging avian and mammalian insectivores at the Hudson Branch wetland while detected concentrations of vanadium provide a potential risk to foraging avian insectivores. These PCOPECs were retained as surface soil COPECs for the Hudson Branch wetland and are recommended for further evaluation.

Exposure Pathways at Risk

The concentrations of aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc detected in surface water samples and concentrations of chromium, copper, lead, mercury, nickel and zinc in sediment samples collected from the Hudson Branch indicate impacts are possible to aquatic organisms inhabiting this habitat. Potential impacts are possible to aquatic organisms via direct contact and/or ingestion of particles containing one or more of these COPECs.

The mean sediment concentrations of antimony, barium, chromium, copper, mercury and vanadium are predicted to potentially result in adverse impacts to several ecological guilds that forage within the habitats provided by the Hudson Branch. Specifically, insectivorous birds and mammals that forage at the Hudson Branch may potentially be impacted by the estimated mean concentrations of antimony, barium, chromium, copper, mercury and/or vanadium present in their prey (aquatic invertebrates). Herbivorous birds and mammals may also be at risk from sediment chromium concentrations via incidental sediment ingestion and plant ingestion.

Terrestrial plants (primarily roots and seeds) that are in direct contact with surface soil that contains elevated concentrations of manganese, nickel and vanadium within the eastern storage areas may be susceptible to adverse effects. Vegetation in direct contact with elevated surface soil concentrations of vanadium in surface soils of the southern area and Hudson Branch wetland may also be susceptible to adverse effects.

The mean surface soil concentrations of chromium and vanadium are predicted to potentially result in adverse impacts to several ecological feeding guilds present at the eastern storage areas and Hudson Branch wetlands. Specifically, insectivorous/ invertivorous birds and mammals that forage within the eastern storage areas may potentially be impacted by the estimated mean concentrations of chromium and vanadium present in their prey (terrestrial invertebrates) as well as through incidental soil ingestion. Insectivorous/invertivorous birds and mammals that forage within the Hudson Branch wetland may also be at risk from mean surface soil chromium and vanadium (insectivorous birds only) concentrations via consuming terrestrial invertebrates containing elevated levels of chromium and/or vanadium in their tissues and through incidental soil ingestion. The SLERA concluded that risks were negligible for herbivorous mammals and carnivorous birds and mammals inhabiting the eastern storage areas and the Hudson Branch wetland while no significant potential risks were identified for avian/mammalian herbivores, insectivores or carnivores foraging at either the former lagoons area or the southern area. Therefore, these exposure pathways are not considered to be at risk from surface soil concentrations of contaminants detected at the Site.

Assessment Endpoints

Based on the exposure pathways at risk, eight assessment endpoints are proposed for additional study in the BERA. The proposed assessment endpoints are:

1) Protection of aquatic macroinvertebrates from toxic effects that could adversely affect their survival, reproduction or growth through exposure to metals in surface waters and sediments of the Hudson Branch;

2) Protection of semi-aquatic herbivorous mammals inhabiting the Hudson Branch from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to chromium via ingestion of vegetation as well as incidental ingestion of contaminated sediment;

3) Protection of semi-aquatic herbivorous birds inhabiting the Hudson Branch from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to chromium via ingestion of vegetation as well as incidental ingestion of contaminated sediment;

4) Protection of semi-aquatic insectivorous mammals foraging at the Hudson Branch from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to antimony, chromium and/or vanadium via ingestion of aquatic invertebrates;

5) Protection of semi-aquatic insectivorous birds foraging at the Hudson Branch from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to barium, chromium, copper, mercury and/or vanadium via ingestion of aquatic invertebrates;

6) Protection of terrestrial vegetation within the eastern storage areas, southern area and Hudson Branch wetlands from toxic effects that could adversely affect their survival or growth through exposure to chromium, manganese, nickel and/or vanadium present in surface soils;

7) Protection of terrestrial invertivorous mammals foraging within the eastern storage areas and Hudson Branch wetlands from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to chromium and/or vanadium from ingestion of terrestrial invertebrates as well as incidental ingestion of contaminated surface soils;

8) Protection of terrestrial invertivorous birds foraging within the eastern storage areas and Hudson Branch wetlands from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to chromium and/or vanadium from ingestion of terrestrial invertebrates as well as incidental ingestion of contaminated surface soils.

Conceptual Model and Risk Questions

A revised Site Conceptual Model is presented in Figure C-1 that identifies the exposure pathways at risk that will be further investigated in the BERA. The eight identified assessment endpoints are also identified in the revised Site Conceptual Model. The basic risk question for this Site is whether concentrations of COPECs present in surface water, sediment, and surface soils at the Site have the potential to result in adverse effects on the eight selected assessment endpoints. Specifically, the following four questions will be addressed in the BERA:

1) Do the concentrations of aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc detected in surface water and concentrations of chromium, copper, lead, mercury, nickel and zinc detected in sediment indicate present risks to aquatic organisms inhabiting the Hudson Branch?

2) Do the concentrations of antimony, barium, chromium, copper, mercury and/or vanadium present in sediment, aquatic vegetation and/or aquatic invertebrates indicate risk to herbivorous and/or insectivorous birds and mammals foraging within the Hudson Branch?

3) Do the concentrations of chromium, manganese, nickel and/or zinc present in the surface soils of the eastem storage area, southem area, and/or Hudson Branch wetland indicate risk to terrestrial plants present in these areas?

4) Do the concentrations of chromium and vanadium present in the surface soils and/or terrestrial invertebrates of the eastem storage area and/or Hudson Branch wetland indicate risk to terrestrial insectivores/invertivores foraging in these areas?

Measurement Endpoints

The measurement endpoints proposed for the BERA expand upon those presented in the SLERA. Proposed measurement endpoints for each of the eight selected assessment endpoints are discussed below. Each of the measurement endpoints are discussed in greater detail within this BERA Scope of Work.

1) Protection of aquatic invertebrates present within the Hudson Branch from COPECs present within the surface water and the sediment. In order to further evaluate the risk to aquatic macroinvertebrates, several measurement endpoints are proposed and include: a) comparison of total and dissolved concentrations of metals (including aluminum, chromium, copper, iron, manganese, nickel, vanadium and zinc) in surface water samples proposed to be collected from the Hudson Branch in 2011 with applicable toxicity reference values (TRVs) protective of aquatic organisms; b) comparison of surface water and sediment concentrations of metals (including aluminum, chromium, copper, iron, lead, manganese, mercury, nickel, vanadium and zinc) detected in Hudson Branch samples with surface water and sediment reference samples proposed to be collected from the Bumt Mill Branch in 2011; and c) sediment toxicity testing conducted for effects on survival, growth and reproduction of an amphipod (*Hyalella azteca*).

2) Protection of semi-aquatic herbivorous mammals inhabiting the Hudson Branch from exposure to chromium via ingestion of vegetation as well as incidental ingestion of contaminated sediment. In order to further evaluate the risk to semi-aquatic mammalian herbivores, one measurement endpoint is proposed but additional sampling will eliminate uncertainties associated with this endpoint. The measurement endpoint will involve calculation of the estimated mean and mean upper confidence limit (UCL) chromium exposure to the muskrat and a comparison of the ingested doses to mammalian no observable adverse effect level (NOAEL) and maximum acceptable toxicant concentration (MATC) TRVs for chromium. Sampling to determine concentrations of chromium within aquatic vegetation will be conducted to reduce the uncertainty associated with modeling sediment chromium concentrations into aquatic plant tissues.

3) Protection of semi-aquatic herbivorous birds inhabiting the Hudson Branch from exposure to chromium via ingestion of vegetation as well as incidental ingestion of contaminated sediment. In order to further evaluate the risk to semi-aquatic avian herbivores, one measurement endpoint is proposed but additional sampling will eliminate uncertainties associated with this endpoint. The measurement endpoint will involve calculation of the estimated mean and mean UCL chromium exposure to the mallard and a comparison of the ingested doses to avian NOAEL and MATC TRVs for chromium. Sampling to determine concentrations of chromium within aquatic vegetation will be conducted to reduce the uncertainty associated with modeling sediment chromium concentrations into aquatic plant tissues.

4) Protection of semi-aquatic insectivorous mammals foraging at the Hudson Branch from exposure to antimony, chromium and vanadium via ingestion of aquatic invertebrates. In order to further evaluate the risk to semi-aquatic mammalian insectivores, one measurement endpoint is proposed that involves additional samphng to eliminate uncertainties associated with this endpoint. The measurement endpoint will involve calculation of the estimated mean and mean UCL antimony, chromium, and vanadium exposure to the little brown bat and a comparison of the ingested doses to mammalian NOAEL and MATC TRVs for antimony, chromium and vanadium. Sampling to determine concentrations of antimony, chromium and vanadium within aquatic invertebrates will be conducted to reduce the uncertainty associated with modeling sediment concentrations of these COPECs into aquatic invertebrate tissues.

5) Protection of semi-aquatic insectivorous birds foraging at the Hudson Branch from exposure to barium, chromium, copper, mercury and vanadium via ingestion of aquatic invertebrates. In order to further evaluate the risk to semi-aquatic avian insectivores, one measurement endpoint is proposed that involves additional sampling to eliminate uncertainties associated with this endpoint. The measurement endpoint will involve calculation of the estimated mean and mean upper confidence limit (UCL) barium, chromium, copper, mercury and vanadium exposure to the tree swallow and a comparison of the ingested doses to avian NOAEL and MATC TRVs for barium, chromium, copper, mercury and vanadium. Sampling to determine concentrations of barium, chromium, copper, mercury and vanadium within aquatic invertebrates will be conducted to reduce the uncertainty associated with modeling sediment concentrations of these COPECs into aquatic invertebrate tissues.

6) Protection of terrestrial vegetation within the eastem storage areas, southem area and Hudson Branch wetlands from COPECs present in surface soils. In order to further evaluate the risk to terrestrial plants, one measurement endpoint is proposed and will involve a qualitative evaluation of the terrestrial plant community in areas containing elevated concentrations of chromium, manganese, nickel and/or vanadium for signs of plant stress and/or toxicity.

7) Protection of terrestrial invertivorous mammals foraging at the eastern storage areas and Hudson Branch wetlands from exposure to chromium and/or vanadium via ingestion of terrestrial invertebrates and incidental ingestion of soil. In order to further evaluate the risk to terrestrial mammalian invertivores, one measurement endpoint is proposed that involves additional sampling to eliminate uncertainties associated with this endpoint. The measurement endpoint will involve calculation of the estimated mean and mean UCL chromium and vanadium exposure to the short-tailed shrew and a comparison of the ingested doses to mammalian NOAEL and MATC TRVs for chromium and vanadium. Sampling to determine concentrations of chromium and vanadium within terrestrial invertebrates will be conducted to reduce the uncertainty associated with modeling surface soil concentrations of these COPECs into terrestrial invertebrate tissues.

8) Protection of terrestrial invertivorous birds foraging at the eastern storage areas and Hudson Branch wetlands from exposure to chromium and vanadium via ingestion of terrestrial invertebrates and incidental ingestion of soil. In order to further evaluate the risk to terrestrial avian invertivores, one measurement endpoint is proposed that involves additional sampling to eliminate uncertainties associated with this endpoint. The measurement endpoint will involve calculation of the estimated mean and mean UCL chromium and vanadium exposure to the American robin and a comparison of the ingested doses to avian NOAEL and MATC TRVs for chromium and vanadium. Sampling to determine concentrations of chromium and vanadium within terrestrial invertebrates will be conducted to reduce the uncertainty associated with modeling surface soil concentrations of these COPECs into terrestrial invertebrate tissues.

Table 4-1 of the SLERA presents the input parameters that will be used to estimate exposure for the selected indicator species (i.e., muskrat, mallard, little brown bat, tree swallow, short-tailed shrew and American robin). For each of the individual indicator species discussed above, the assessment endpoint references an impact on survival, growth or reproduction of a population. Adverse effects on populations can be inferred from measures associated with impaired survival, growth or reproduction. Estimated COPEC exposure doses for each of these indicator species will be compared to chronic NOAEL and MATC survival, reproductive, or growth effect levels reported in the literature. An exposure dose that exceeds the chronic MATC indicates adverse effects may result to that receptor. Proposed chronic NOAEL and MATC values are presented in Table 6-9 of the SLERA.

Proposed BERA Studies

Additional sampling and testing are proposed to further evaluate potential risks identified in the SLERA. These studies include additional surface water and sediment sampling, laboratory toxicity testing of sediment, sampling of aquatic vegetation and aquatic invertebrates to determine tissue concentrations of COPECs, a qualitative plant community assessment, and a study to determine concentrations of chromium and vanadium within terrestrial invertebrates. Each of these proposed studies is discussed

below. The Supplemental Remedial Investigation (RI) Workplan (WP) and/or the Quality Assurance Project Plan (QAPP) that are being submitted concurrently with the SLERA and this BERA Scope of Work address the BERA field sampling/studies proposed below.

Surface Water Sampling – The latest surface water samples analyzed from the Hudson Branch and reference stream (Bumt Mill Branch) were collected in 1995. Surface water samples are proposed to be collected from both the Hudson Branch (including Bumt Mill Pond) and Bumt Mill Branch. Samples will include total and dissolved concentrations of TAL metals and hexavalent chromium as well as TCL VOCs and hardness. Sufficient samples will be collected to allow statistical comparisons between the Hudson Branch and reference stream samples. Sampling locations and proposed analyses are presented in the Supplemental RI WP and QAPP. Results of the proposed 2011 surface water samples will be evaluated in the BERA using surface water benchmarks presented in the SLERA. Statistical comparisons between Hudson Branch and reference surface water samples will be conducted using ProUCL version 4.1.

Sediment Sampling – Additional sediment samples are proposed to be collected from the Hudson Branch (including Bumt Mill Pond) and a reference stream (Burnt Mill Branch) in order to allow statistical comparisons between the Hudson Branch and reference stream samples. Sampling locations and proposed analyses are presented in the Supplemental WP and QAPP. Results of the proposed 2011 surface water samples will be evaluated in the BERA using sediment benchmarks presented in the SLERA. Statistical comparisons between Hudson Branch and reference sediment samples will be conducted using ProUCL version 4.1.

Sediment Toxicity Testing – The SLERA concluded that concentrations of various inorganics within sediment samples collected from the Hudson Branch are substantially elevated over levels associated with probable adverse effects to benthic macroinvertebrates. Previous testing of sediments at the Site that were conducted by TRC (as well as other sites in the Pinelands region) have concluded that the amphipod *Hyalella azteca* is a sensitive test organism for metals and is more suitable that a midge species (e.g., *Chironomus tentans*).

In order to evaluate the toxicity of these elevated concentrations to aquatic macroinvertebrates and to assist in determining appropriate remediation goals for Hudson Branch sediment, laboratory testing of 6 sediment samples within the Hudson Branch and 2 sediment samples within the Bumt Mill Branch (reference area) will be conducted using *H. azteca*. Exposure by *H. azteca* to sediments will occur during a chronic 42-day test period after which survival, growth (by dry weight), and reproduction will be evaluated for each of the sediment samples. The laboratory toxicity testing will be conducted in accordance with Test Method EPA/600/R-99/064 Method 100.4. Statistical comparisons will be conducted between each of the Hudson Branch sample results with a laboratory control and the reference samples.

Based on previous sampling, the selected sediment sampling locations contain a range of COPEC concentrations that will be used to evaluate the effects of the sediment

concentrations to aquatic macroinvertebrates. Sediment will be collected at each sampling location for the toxicity tests as well as for chemical analyses (TCL SVOCs, TCL Pesticides/PCBs, TAL metals, total organic carbon (TOC), particle grain size, and pH). The proposed sampling locations within the Hudson Branch are SD-10, SD-13, SD-15, SD-18, SD-04 and SD-23 while the reference area samples proposed to be collected from Bumt Mill Branch include SD-31 and SD-35. The locations of these samples are depicted on Figure 2-5 of the SLERA. Each of these samples represent sampling locations proposed in the Supplemental RI WP.

Aquatic Vegetation Sampling – Eight aquatic plant tissue samples are proposed to be collected from the Hudson Branch while two additional samples will be collected from Bumt Mill Branch. Sediment samples will be collected concurrently at the location of the aquatic vegetation samples. The purpose of the aquatic vegetation tissue study is to assess the bioavailability of chromium by measuring chromium concentrations in foods (aquatic vegetation) consumed by the assessment endpoints (semi-aquatic herbivorous birds and mammals). Both sediment and aquatic plant samples will be analyzed for chromium (total). Aquatic vegetation samples will include plants that are rooted into sediment and, if present, represent foods consumed by foraging muskrats and/or mallards. Examples of forage plants include smartweed (*Polygonum* spp.), arrowhead (*Sagittaria* spp.), burreed (*Sparganium* spp.), waterlillies/pond lillies (*Nymphaea* spp./*Nuphar* spp.), Naiad (*Najas* spp.), cattail (*Typha* spp.), and pondweed (*Potamogeton* spp.). Samples will be collected in the field using stainless steel scissors and the samples placed in Ziploc bags. Each sample will be labeled with the sample location and date of collection. A field notebook will record plant species collected at the sampling location. Samples will be placed on ice in a cooler and transferred to a freezer as soon as possible.

The tentative sampling locations are presented below and in Figure C-2. Note that these sampling locations may change based on conditions noted in the field at the time of the sampling (i.e., absence of aquatic vegetation, nearby presence of preferred aquatic plant items, etc.). The selected locations represent a range of chromium concentrations previously noted in the Hudson Branch sediment samples.

Table C-1. Proposed Sediment & Aquatic Vegetation Sampling Locations.

Sediment Sample ID	Previous Sampling Location	Previous Chromium Conc. (mg/kg)	Aquatic Vegetation Sample ID
BERA-SD-01	SD-1	1,220	BERA-AV-01
BERA-SD-02	SD-10	7,620	BERA-AV-02
BERA-SD-03	SD-13	8,050	BERA-AV-03
BERA-SD-04	SD-17	3,150	BERA-AV-04
BERA-SD-05	SD-19	388	BERA-AV-05
BERA-SD-06	SD-21	133	BERA-AV-06
BERA-SD-07	SD-100A	415	BERA-AV-07
BERA-SD-08	SD-24	83.4	BERA-AV-08
BERA-SD-09	SD-31	1.6	BERA-AV-09
BERA-SD-10	SD-35	38.3	BERA-AV-10

Based on the results of the aquatic vegetation and sediment samples, a site-specific aquatic vegetation:sediment bioaccumulation factor will be determined. This bioaccumulation factor will then be applied to the mean and mean UCL sediment chromium concentrations to obtain a mean and mean UCL aquatic vegetation chromium concentration for estimating exposure by the selected indicator species (muskrat and mallard).

Aquatic Invertebrate Sampling – Eight aquatic invertebrate samples are proposed to be collected from the Hudson Branch while two additional reference samples will be collected from Burnt Mill Branch. Sediment samples will be collected concurrently at the location of the aquatic invertebrate samples. The purpose of the aquatic invertebrate tissue study is to assess the bioavailability of the COPECs by measuring COPEC concentrations in foods (aquatic invertebrates) consumed by the assessment endpoints (insectivorous birds and mammals). Both sediment and aquatic invertebrate samples will be analyzed for antimony, barium, chromium (total), copper, mercury and vanadium. Note that this list of COPECs to be analyzed may be reduced based on the comparison of Hudson Branch sediment sampling results with reference sediment concentrations. Only those sediment COPECs detected at significantly higher concentrations within Hudson Branch samples (using ProUCL version 4.1 as discussed above) will be retained as COPECs and analyzed in aquatic invertebrate tissues. Aquatic invertebrate samples will preferentially include aquatic insect species that are emergent species that may be consumed by foraging aerial insectivores. Examples of emergent insect species include mayflies (Ephemeroptera) and stoneflies (Plecoptera) but may also include damselflies/dragonflies (Odonata) to obtain sufficient sampling mass for the laboratory analyses.

The tentative sampling locations are the same as presented for aquatic vegetation (see Figure C-2). Sampling nomenclature will be BERA-AI-01 through -10. The aquatic invertebrates will be collected using a D-Frame or rectangular aquatic net. Each sample will be collected as close as possible to its associated sediment sample. The invertebrates will be identified in a sorting tray, rinsed with deionized water, and placed into clean sampling jars. Each sample will be labeled with the sample location and date of collection. A field notebook will record invertebrate types collected at the sampling location and their relative percent contribution to the sample. Invertebrates will be identified in the field to the lowest practicable taxon. Samples will be placed on ice in a cooler and transferred to a freezer as soon as possible.

Based on the results of the aquatic invertebrate and sediment samples, a site-specific aquatic invertebrate:sediment bioaccumulation factor will be determined. This bioaccumulation factor will then be applied to the mean and mean UCL sediment COPEC concentrations to obtain a mean and mean UCL aquatic invertebrate COPEC concentration for estimating exposure by the little brown bat and tree swallow.

Terrestrial Plant Community Evaluation – A qualitative plant community assessment study is proposed to evaluate potential impacts to terrestrial plants from surface soil concentrations of chromium, manganese, nickel, and/or vanadium present within the eastern storage areas, southern area and/or Hudson Branch wetlands. The qualitative

assessment will consist of inspecting existing vegetation within these areas for signs of stress potentially attributable to elevated concentrations of terrestrial plant COPECs.

The literature identifies various symptoms associated with phytotoxicity attributable to elevated concentrations of chromium, manganese, nickel and vanadium. Effects on plants from chromium include reduced plant height (i.e., stunting) and shoot growth as well as wilting (Shanker et al., 2005) while common manganese phytotoxic symptoms include necrotic brown spotting on leaves, petioles and stems and "crinkle-leaf" which occurs in young leaf, stem and petiole tissues (Reichman, 2002). Nickel symptoms associated with phytotoxicity include interveinal chlorosis and necrosis of leaves in dicots while grasses exhibit banded chlorosis (Kukier and Chaney, 2004). Vanadium symptoms include chlorosis and dwarfing (stunted growth) (Anke, 2004).

Vegetation within portions of the eastern storage areas, southern area and Hudson Branch wetland containing elevated concentrations of chromium, manganese, nickel and/or vanadium will be examined for signs of plant stress as discussed above. If noted, photographs will be taken and the approximate extent of the visible signs of plant stress will be recorded.

Terrestrial Invertebrate Sampling – Six and eight terrestrial invertebrate samples are proposed to be collected from the eastern storage areas and Hudson Branch wetlands, respectively, while two additional samples will be collected at reference locations. Surface soil samples will be collected concurrently at the location of the terrestrial invertebrate samples. The purpose of the terrestrial invertebrate tissue study is to assess the bioavailability of the COPECs by measuring COPEC concentrations in foods (terrestrial invertebrates) consumed by the assessment endpoints (invertivorous birds and mammals). Both surface soil and terrestrial invertebrate samples will be analyzed for chromium and vanadium. Terrestrial invertebrate samples will preferentially include earthworms that may be consumed by foraging invertivores.

Samples of terrestrial invertebrates and surface soils will be collected across a gradient of COPEC concentrations (based on the previous surface soil sampling results) in order to develop a site-specific terrestrial invertebrate:soil bioaccumulation factor for the eastern storage areas and the Hudson Branch wetland. These bioaccumulation factors will then be used in the baseline ecological risk assessment to estimate terrestrial invertebrate COPEC concentrations throughout these areas and to estimate COPEC exposure by the selected assessment endpoints (shrew and robin).

The tentative sampling locations are presented below and in Figure C-3. The selected locations represent a range of chromium concentrations previously noted in the eastern storage areas and Hudson Branch wetland surface soil samples. Eight co-located surface soil and terrestrial invertebrate samples are proposed for collection at the Hudson Branch wetland and six co-located samples within the eastern storage areas. Two co-located surface soil and terrestrial invertebrate samples are proposed within reference areas. Note that these sampling locations may change based on conditions noted in the field at the time of the sampling (i.e., absence of terrestrial invertebrates).

Table C-2. Proposed Surface Soil & Terrestrial Invertebrate Sampling Locations.

Surface Soil Sample ID	Sampling Area	Previous Sampling Location	Previous Cr Conc. (mg/kg)	Previous Vd Cone. (mg/kg)	Terrestrial Invertebrate Sample ID
BERA-SS-01	Hudson Branch Wetland	RA-14	218	2,560	BERA-TI-01
BERA-SS-02	Hudson Branch Wetland	SS-19	45.75	571	BERA-TI-02
BERA-SS-03	Hudson Branch Wetland	RA-05	29.7	203	BERA-TI-03
BERA-SS-04	Hudson Branch Wetland	SD-107A	7,830	2,370	BERA-TI-04
BERA-SS-05	Hudson Branch Wetland	SD-105D	156	777	BERA-TI-05
BERA-SS-06	Hudson Branch Wetland	SD-103A	766	529	BERA-TI-06
BERA-SS-07	Hudson Branch Wetland	SD-I02A	523	588	BERA-TI-07
BERA-SS-08	Hudson Branch Wetland	SD-I01B	710	290	BERA-TI-08
BERA-SS-09	Eastem Storage Areas	RA-27	57.6	453	BERA-TI-09
BERA-SS-10	Eastem Storage Areas	RA-34	148	2,450	BERA-TI-10
BERA-SS-11	Eastem Storage Areas	RA-28	368	4,750	BERA-TI-11
BERA-SS-12	Eastem Storage Areas	RA-32	469	436	BERA-TI-12
BERA-SS-13	Eastem Storage Areas	RA-49	38.3	4,875	BERA-TI-13
BERA-SS-14	Eastem Storage Areas	RA-50	38.3	2,660	BERA-TI-14
BERA-SS-15	Reference Area	-	-	-	BERA-TI-15
BERA-SS-16	Reference Area	-	-	-	BERA-TI-16

Terrestrial invertebrate samples will be co-collected with surface soils at each sampling location and will include soil invertebrates such as earthworms if present. Sample collectlon will be conducted with stainless steel spoons/shovels and involve placing soil into a large stainless steel sampling bowl where invertebrates will be separated and placed into glass jars. Any invertebrate retained for sampling will be free of loose soil and detritus. If sufficient mass of soil invertebrates cannot be obtained at the surface soil sampling location, then sampling of terrestrial insects may supplement the collected soil

invertebrate mass by extending the sampling radially from the soil sample (to a maximum of five feet) until sufficient invertebrate mass is collected. Invertebrates can be collected by searching under rocks, debris and by sweeping vegetation with a heavy-duty sweep net.

Each sample will be labeled with the sample location and date of collection. A field notebook will record invertebrate types collected at the sampling location and their relative percent contribution to the sample. Invertebrates will be identified in the field to the lowest practicable taxon. Samples will be placed on ice in a cooler and transferred to a freezer as soon as possible.

In the event that sufficient mass of invertebrate tissue cannot be collected at a particular sampling location or within an area of concern (eastern storage area or Hudson Branch wetland), then a laboratory–based bioaccumulation study from soil to earthworms will be undertaken. The laboratory bioaccumulation study involves placing earthworms (*Eisenia foetida*) into soil samples collected from the Site for a period of 28 days. The earthworm bioaccumulation test will follow ASTM D1676-97 guidelines. After the exposure period is complete, earthworms are analyzed for chromium and vanadium. These results are then compared to the soil sampling results to determine appropriate site-specific bioaccumulation factors.

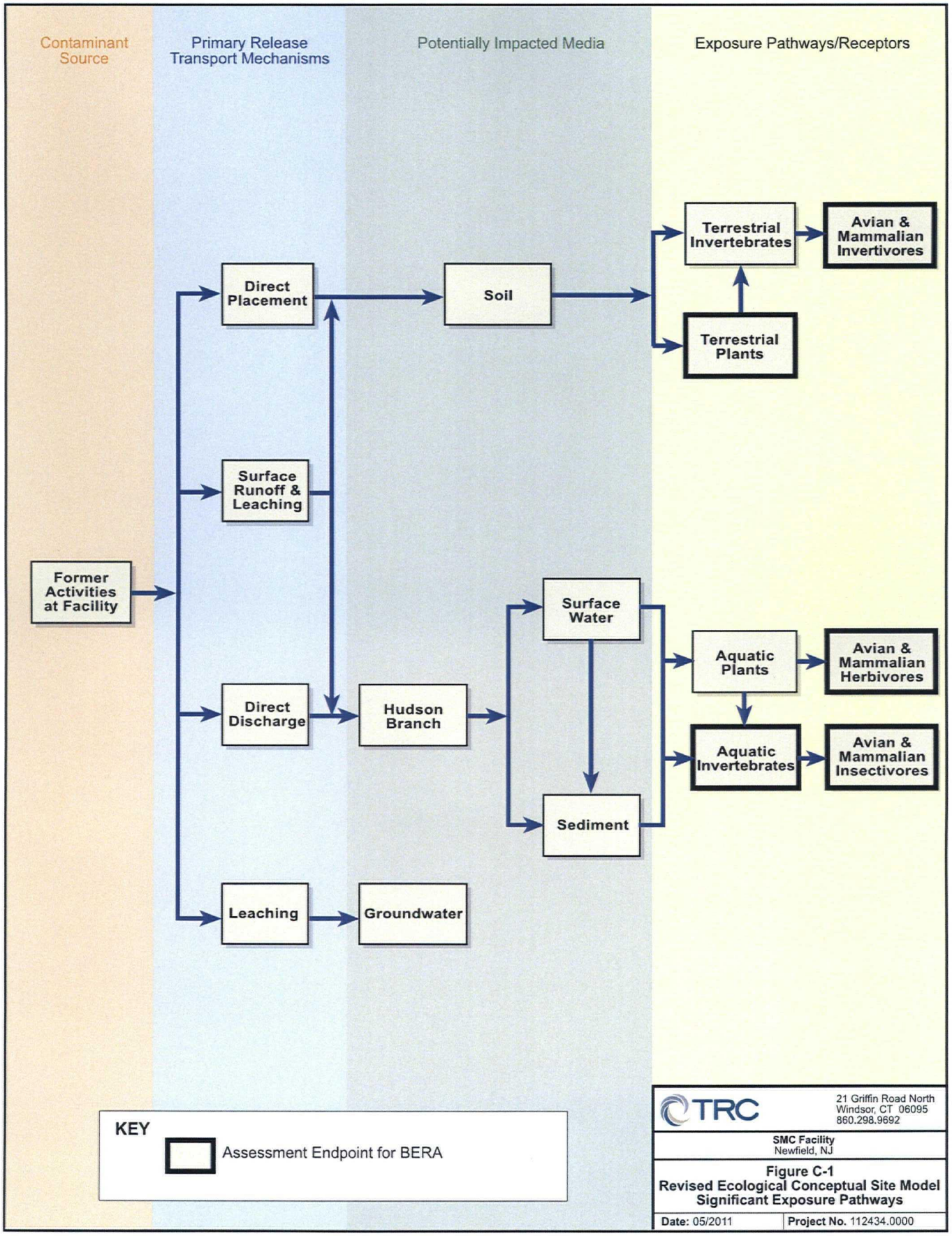
Literature Cited

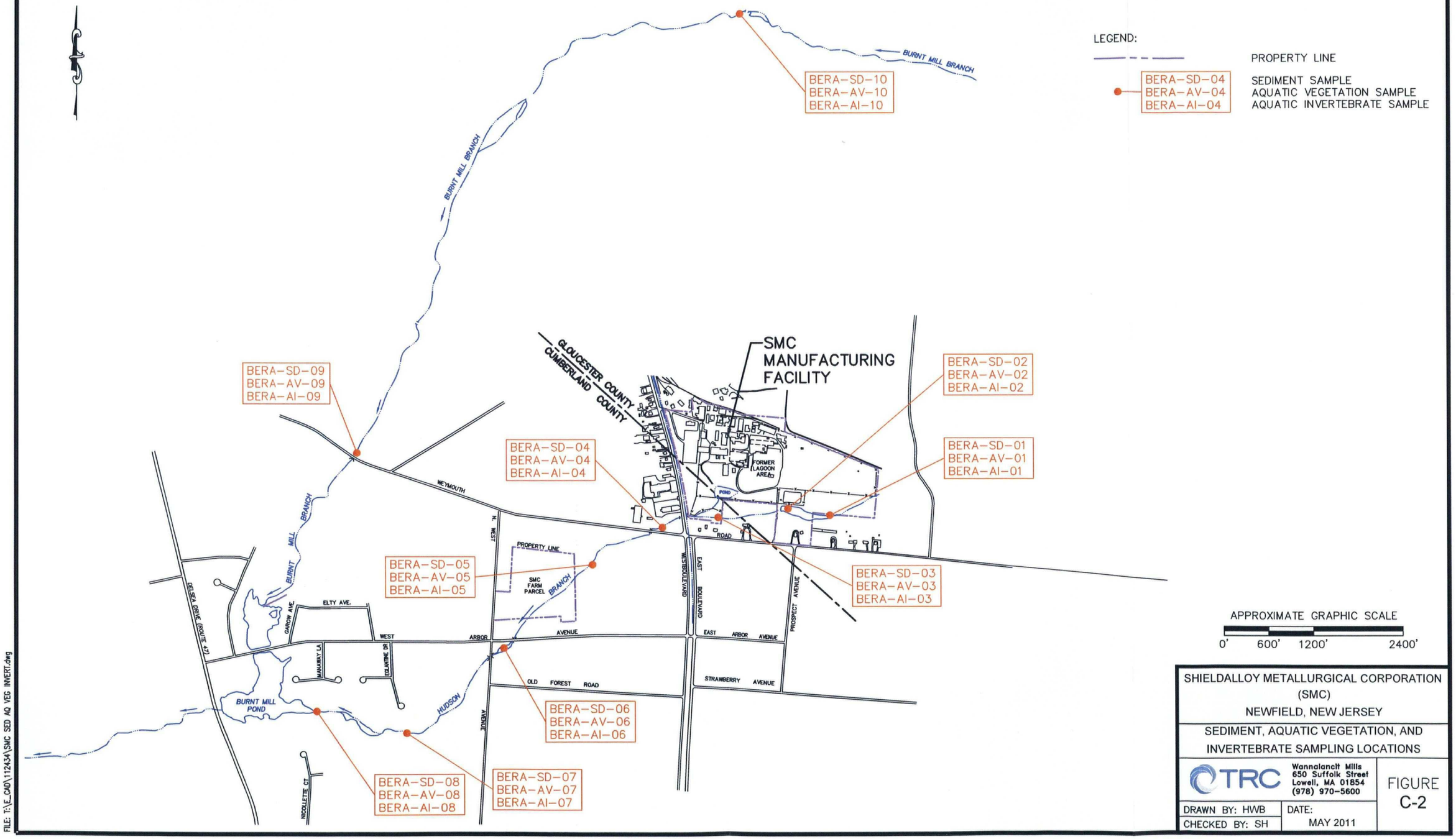
Anke, M. 2004. Vanadium – An element both essential and toxic to plants, animals, and humans? Anal. Real Acad. Nac. Farm., Vol. 70: 961-999.

Kukier, U., and R.L. Chaney. 2004. In situ remediation of nickel phytotoxicity for different plant species. J. Plant Nutrition, Vol. 27(3): 465-495.

Reichman, S.M. 2002. The responses of plants to metal toxicity: a review focusing on copper, manganese and zinc. Occ. Paper No. 14. Austal. Minerals & Energy Environ. Found.

Shanker, A.K., C. Cervantes, H. Loza-Tavera, and S. Avudainayagam. 2005. Chromium toxicity in plants. Environment International Vol. 31: 739-753.


Contaminant Source
Primary Release Transport Mechanisms
Potentially Impacted Media
Exposure Pathways/Receptors
Former Activities at Facility
Direct Placement
Surface Runoff & Leaching
Direct Discharge
Leaching
Soil
Hudson Branch
Groundwater
Surface Water
Sediment
Terrestrial Invertebrates
Terrestrial Plants
Aquatic Plants
Aquatic Invertebrates
Avian & Mammalian Invertivores
Avian & Mammalian Herbivores
Avian & Mammalian Insectivores
KEY
Assessment Endpoint for BERA
TRC
21 Griffin Road North
Windsor, CT 06095
860.298.9692
SMC Facility
Newfield, NJ
Figure C-1
Revised Ecological Conceptual Site Model
Significant Exposure Pathways
Date: 05/2011
Project No. 112434.0000



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SEDIMENT, AQUATIC VEGETATION, AND
INVERTEBRATE SAMPLING LOCATIONS

TRC
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FIGURE
C-2

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CHECKED BY: SH
DATE:
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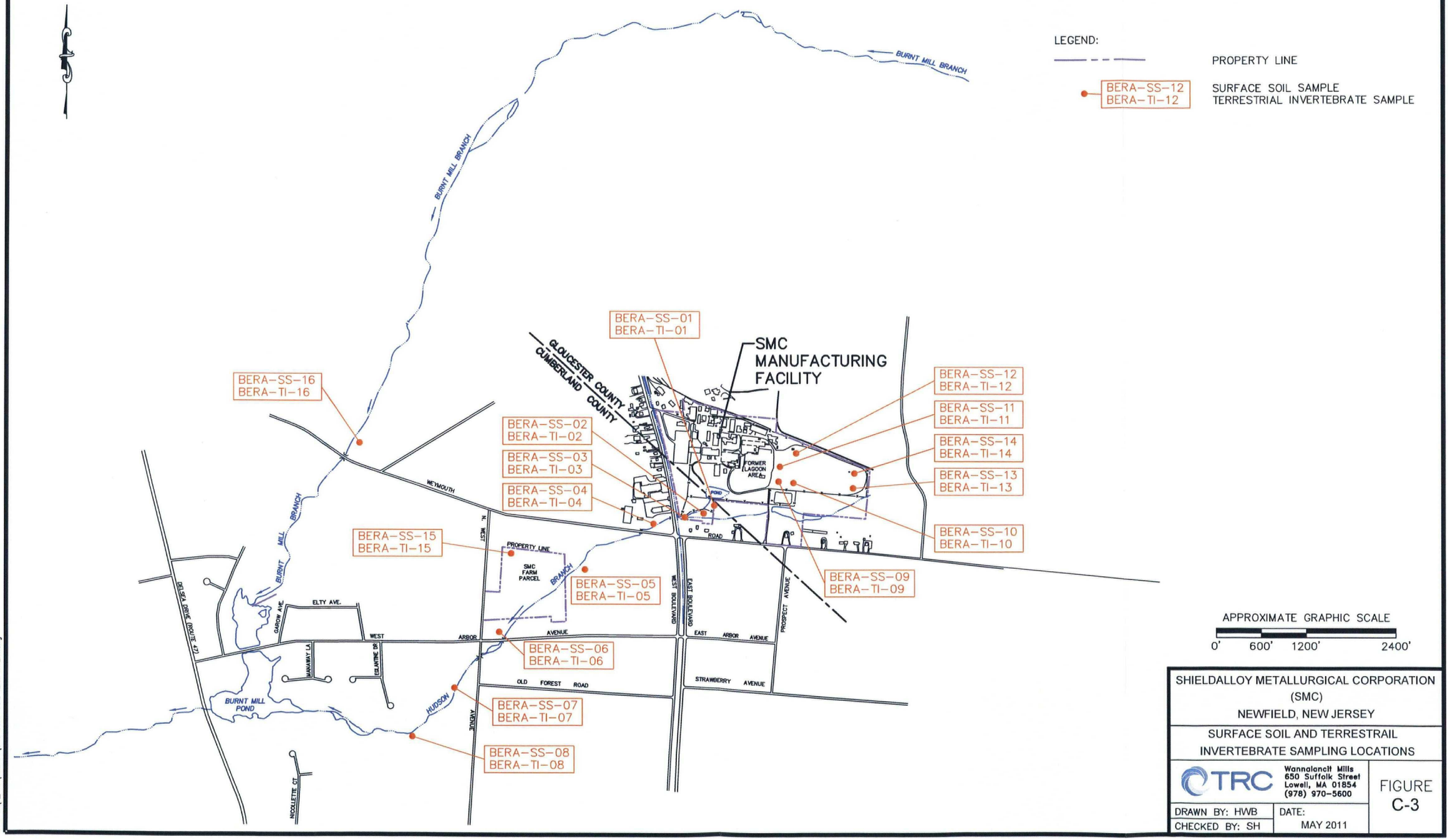

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SURFACE SOIL AND TERRESTRAIL
INVERTEBRATE SAMPLING LOCATIONS

TRC
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FIGURE
C-3

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